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THE MASSACHUSETTS AGRICULTURAL REPOSITORY, AND JOURNAL.

VOLUME III.

PUBLISHED BY THE TRUSTEES OF THE MASSACHUSETTS SOCIETY FOR PROMOTING AGRICULTURE.

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PREFACE.

The Trustees of the Massachusetts Society for promoting Agriculture, offer to the public the first number of a new series of their publications. Should the stock of communications put it in their power to issue them hereafter quarterly, they shall execute the duty which will devolve on them, with great pleasure.

The various topicks of Agriculture have already been treated by able writers, and frequent attempts made to rouse the spirit of careless and improvident cultivators, by eloquent appeals to their interest, patriotism, and philanthropy. But the kind of book from which the farmer will, without doubt, derive the greatest advantage and the instruction of which he stands most in need, is, that which makes known to him the practice and experience of the most active and intelligent men, inhabiting the same district of country with himself, and not dissimilarly circumstanced as respects climate, soil, and the general face of the country.

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There are maxims in Agriculture of universal application, and *hints* derived from a foreign country sometimes lead to important improvements, but the attention is more deeply engaged, and the memory more strongly impressed by what passes in our own neighbourhood, besides, narratives of improvements in distant countries are commonly viewed with distrust, and disregarded often as mere innovations. It is far otherwise with what takes place in the society, town, or county, or State to which we belong; the accounts can either be verified by our own observation, or are admitted without question as true, from the known credibility of those from whom they are derived.

How far modes of culture practised in other countries are suitable to our own, is matter of inquiry for gentlemen of leisure and intelligence; their testimony will be heard with interest by the farmers at large, and their recommendations adopted with thankfulness and followed as the sure road to wealth.

From these remarks it will appear to be the object of the Trustees in their future publications, as in their former, to open a channel of communication between the several Agricultural Societies in this Commonwealth, and between the individual farmers

of the same county and of the same town, to promote as far as it may be in their power, a frequent and familiar interchange of practical hints—to carry the knowledge of new facts from one farm to another, and to record for the benefit of the present generation and that of our posterity, the course of husbandry of the good farmers of Massachusetts.

A work of this kind, lays no claim to literary distinction. It will be open to the communications of all farmers. Their inquiries will receive respectful attention; and any doubts or difficulties will be immediately considered and answered, or published for the consideration of the speculative.

The simple, plain, and familiar style used in common life, is found often to convey as precise ideas on subjects of business as the more refined language of the scholar. It is hoped, therefore, that our intelligent husbandmen, who have not leisure to attend to the arts of composition, will not be deterred by too great delicacy from communicating for publication, the results of their experience. They should reflect, that it will operate to induce others to do likewise. And the mutual encouragement afforded by example, will thus be the means of bringing together a mass of information, highly interesting and profitable to all.

Great expectations are formed from the numerous town societies, instituted recently for the promotion of agriculture. The promptitude with which they have been organized, and the zeal they have manifested is highly flattering to the object. All such societies will be entitled, of course, to a copy of these publications, and to a number for distribution to individuals, as a reward of good husbandry. Correspondents will also be entitled to a copy of the number in which their communications shall appear.

PREMIUMS

OFFERED BY THE TRUSTEES OF THE MASSACHUSETTS SOCIETY FOR PROMOTING AGRICULTURE.

1. To the person who shall produce the largest quantity of wool, meat and tallow, from the smallest number of sheep, not less than ten, raised on his own farm, a premium of *thirty dollars ;* to be claimed on or before the 1st day of August, 1814.

2. To the person who shall invent a cheap method of raising water, for the purpose of irrigating land from rivers and ponds from ten to twenty feet above the level of the same, and give evidence thereof to the satisfaction of the Trustees, on or before January 1, 1814, *one hundred dollars*, or the Society's gold medal.

3. To the person who shall present to this Society the most complete (being nearly complete) Hortus Siccus, exhibiting distinct specimens of the greatest variety of grasses in general use, and specify to the satisfaction of the Trustees, their respective qualities, productiveness, and usefulness as food for different kinds of animals, the gold medal, and *fifty dollars ;* to be claimed on or before the 1st day of October, 1814.

4. To the person who shall produce from seed, the best growth of thrifty trees, not less than six hundred in the whole, and in the proportion of 2400 to the acre, of any of the following kinds of forest trees, viz. oak, ash, elm, sugar maple, beech, black or yellow birch, chesnut, walnut or hickory, *twenty-five dollars ;* if all of oak, *fifty dollars.* Claims to be made on or before the first of October, 1814.

5. To the person who shall ascertain by accurate analysis, the constituent parts of several fertile soils respectively, and in like manner the parts of several poor soils, and thus shall discover the defects of the latter ; and shall show by actual experiments, how the said defects may be remedied by the addition of earths or other ingredients which abound in the country, and in a manner that may be practised by common farmers, *fifty dollars.* And if it shall appear to the satisfaction of the Trustees, that,

upon an extensive practice, the improvement of the poor soil would be more than equivalent to the expense of the improvement, the addition of *one hundred dollars.* A minute description of the several soils, and all the circumstances attending the processes, cultivation, and results, will be required. Claims to be made on or before November 1, 1814.

6. To the person who shall produce a machine for cleansing butter from its whey or butter milk without working with the hand, *fifty dollars.* Said machine must be approved by such persons as the Trustees shall appoint, and it must be procured so cheap as to be of general utility.

7. It is required that the communications, for which the foregoing premiums are offered, be accompanied with proper certificates from the selectmen, magistrates, or clergymen of the vicinity, or other vouchers, to the satisfaction of the Trustees; that they be delivered without names, or any intimation to whom they belong; and that they be severally marked in such manner as each claimant shall think fit; the claimant sending also a paper, sealed up, having on the outside a corresponding mark, and on the inside his name and address.

RICHARD SULLIVAN, *Recording Secretary.*

MASSACHUSETTS

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OF SOILS AND MANURES.

The importance of the subject would be a sufficient apology, should our publications be found to treat frequently of *Manures*. The following extracts from a valuable Treatise of the celebrated Dr. Kirwan, entitled, "Manures most advantageously applicable to the various kinds of soils, &c." will be read with interest by every Farmer. It is rare that a work so learned is so well adapted to the mass of general readers. We commence with the analysis of *Soils*.

OF SOILS.

Land, considered as the basis of vegetation, is called *soil.*

Soils consist of different combinations of two or more of the four primitive earths, namely, the calcareous (which I sometimes call mild calx) magnesia, argill, and the silicious. For a more accurate description of these I must refer to books of mineralogy; and shall only remark, that by calcareous earths are meant chalk, and all stones that burn to lime. They are easily distinguished by their property of effervescing with acids.

Magnesia is never found alone; its distinguishing character consists in affording a bitter salt, generally called Epsom Salt, when combined with the vitriolic acid.

Argill is that part of clay to which this owes its property of feeling soft and unctuous, and of hardening in fire; it is difficultly soluble in acids, and scarce ever effervesces with them. When combined with the vitriolic acid, it forms alum.

Silicious earth is often found in a stony form, such as flint or quartz; and still more frequently in that of a very fine sand, such as that whereof glass is made. It does not effervesce, nor is it soluble in any of the common acids.

To these we may add Iron, in that imperfect state in which it exists when reduced to rust, and commonly called Calx of Iron.

The soils most frequently met with, and which deserve a distinct consideration; are clay, chalk, sand, and gravel, clayey loam, chalky loam, sandy loam, gravelly loam, ferruginous loam, boggy soil, and heathy soil, or *mountain*, as it is often called.

Clay is of various colours, for we meet with white, grey, brownish red, brownish black, yellow or bluish clays.

It consists of argill and fine sand, usually of the silicious kind, in various proportions, and more or less ferruginous.

Chalk, if not very impure, is of a white colour, moderate consistence, and dusty surface, stains the fingers, adheres slightly to the tongue, does not harden when heated, but, on the contrary, in a strong heat burns to lime, and loses about four-tenths of its weight—It promotes putrefaction.

Sand. By this is meant small loose grains of great hardness, not cohering with water, nor softened by it.

Gravel differs from sand chiefly in size: however, stones of a calcareous nature, when small and rounded, are often comprehended under that denomination.

Loam denotes any soil moderately cohesive; that is, less so than clay, and more so than loose chalk. By the Author of the Body of Agriculture, it is said to be a clay mixed with sand.

Clayey Loam denotes a compound soil, moderately cohesive, in which the argillaceous ingredient predominates. Its coherence is then greater than that of any other loam, but less than that of pure clay. The other ingredient is a *coarse* sand, with or without a small mixture of the calcareous ingredient. It is this which farmers generally call *strong*, *stiff*, *cold*, and *heavy* loam, in proportion as the clay abounds in it.

Chalky Loam. This term indicates a loam formed of clay, coarse sand, and chalk; in which, however, the calcareous ingredient or chalk much predominates. It is less cohesive than clayey loams.

Sandy Loam denotes a loam in which sand predominates: it is less coherent than either the above mentioned. Sand, partly

coarse and partly fine, forms from 80 to 90 per cent. of this compound.

Gravelly Loam differs from the last only in containing a larger mixture of coarse sand, or pebbles. This and the two last are generally called by farmers, *light* or *hungry* soils; particularly when they have but little depth.

Ferruginous Loam or *Till.* This is generally of a dark brown, or reddish colour, and much harder than any of the preceding: it consists of clay and calces of iron, more or less intimately mixed. It may be distinguished not only by its colour, but also by its superior weight.

Boggy Soil, or *Bogs*, consist chiefly of ligneous roots of decayed vegetables mixed with earth, mostly argillaceous, and sand, and a coaly substance derived from decayed vegetables. Of bogs there are two sorts: the black, which contain a larger proportion of clay and of roots more perfectly decayed, with mineral oil. In the red the roots seem less perfectly decayed, and to form the principal part.

Heathy Soil is that which is naturally productive of heath.

OF MANURES.

Manure denotes any substance or operation by which a soil is improved. To improve a soil is to render it capable of producing corn, legumens, and the most useful grasses.

The substances principally used as manures, are chalk, lime, clay, sand, marl, gypsum, or plaster of Paris, ashes, stable dung, mucks, farm-yard dung, pounded bones, sea-weeds, sweepings of ditches, old ditches. Other manures or top-dressings, as they are employed chiefly to promote the growth of vegetables, and not merely with a view of improving the soil, I omit.

The operations used to improve soils, are fallows, draining, paring and burning.

Of chalk, clays, and sand, we have already treated.

Lime is a substance whose external characters and mode of production are well known. It differs from chalk and powdered limestone chiefly by the absence of fixed air, which is expelled from these during their calcination. This air it greedily reabsorbs from the atmosphere, and all other bodies with which it comes in contact, and which can furnish it; but it cannot unite

with the air, unless it is previously moistened. 100 parts quick-lime absorb about 28 of water. It is soluble in about 700 parts of this fluid. To regain its full portion of air from the atmosphere, it requires a year or more, if not purposely spread out: it resists putrefaction, but with the assistance of moisture. It resolves organic substances into a mucus.

Marl is of three sorts; calcareous, argillaceous, and silicious, or sandy. All are mixtures of mild calx (i. e. chalk) with clay, in such a manner as to fall to pieces by exposure to the atmosphere, more or less readily.

Calcareous Marl is that which is most commonly understood by the term *marl*, without addition. It is generally of a yellowish white, or yellowish grey colour; rarely brown or lead coloured. It is seldom found on the surface of land, but commonly a few feet under it, and on the sides of hills, or rivers that flow through calcareous countries, or under turf in bogs. Frequently of a loose texture, sometimes moderately coherent; rarely of a stony hardness, when it is, it is called *stone-marl.* Sometimes of a compact, sometimes of a lamellar texture; often so thin as to be called *paper-marl.* It often abounds with shells, and then is called *shell-marl;* which is looked upon as the best sort. When in powder, it feels dry between the fingers; put in water, it quickly falls to pieces or powder, and does not form a viscid mass. It chips and moulders by exposure to the air and moisture, sooner or later, according to its hardness and the proportion of its ingredients: if heated, it will not form a brick, but rather lime. It effervesces with all acids. It consists of from 33 to 80 per cent. of mild calx, and from 66 to 20 per cent. of clay.

To find its composition, pour a few ounces of weak, but pure spirit of nitre or common salt into a Florence flask; place them in a scale and let them be balanced; then reduce a few ounces of dry marl into powder, and let this powder be carefully and gradually thrown into the flask, until after repeated agitation no effervescence is any longer perceived; let the remainder of the powdered marl be then weighed, by which the quantity projected will be known; let the balance be then restored; the difference of weight between the quantity projected and that requisite to restore the balance will discover the weight of air lost during effervescence; if the loss amounts to 13 per cwt. of the quantity

of marl projected, or from 13 to 32 per cwt. the marl essayed is calcareous marl. This experiment is decisive, when we are assured by the external characters abovementioned, that the substance employed is marl of any kind; otherwise some sorts of the sparry iron-ore may be mistaken for marl. The experiments to discover the argillaceous ingredient (being too difficult for farmers) I omit. The residue left after solution, being well washed, will, when duly heated, generally harden into a brick.

Argillaceous Marl contains from 68 to 80 per cwt. of clay, and consequently from 32 to 20 per cwt. of aerated calx or chalk. Its colour is grey or brown, or reddish brown, or yellowish, or bluish grey. It feels more unctuous than the former, and adheres to the tongue: its hardness generally much greater. In water it falls to pieces more slowly, and often into square pieces: it also more slowly moulders by exposure to the air and moisture, if of a loose consistence: it hardens when heated, and forms an imperfect brick. It effervesces with spirit of nitre or common salt, but frequently refuses to do so with vinegar. When dried and projected into spirit of nitre in a Florence flask, with the attentions abovementioned, it is found to lose from 8 to 10 per cwt. of its weight. The undissolved part, well washed, will, when duly heated, harden into a brick.

Silicious, or *Sandy Marls*, are those whose clayey part contains an excess of sand: for, if treated with acids in the manner abovementioned, the residuum or clayey part will be found to contain above 75 per cwt. of sand; consequently chalk and sand are the predominant ingredients.

The colour of this marl is brownish grey, or lead-coloured: generally friable and flakey, but sometimes forms very hard lumps. It does not readily fall to pieces in water. It chips and moulders by exposure to the air and moisture, but slowly. It effervesces with acids; but the residuum after solution, will not form a brick.

Limestone Gravel. This is a marl mixed with large lumps of limestone. The marl may be either calcareous or argillaceous; but most commonly the former. The sandy part is also commonly calcareous.

Gypsum or *Plaister of Paris* is a compound of calcareous earth and vitriolic acid: it forms a distinct species of the calca-

reous genus of fossils: of which species there are six families. It promotes putrefaction in a high degree.

Ashes. Sifted coal-ashes, those of peat and white-turf ashes, have been found useful; red-turf ashes useless, and generally hurtful. Wood-ashes have also been employed advantageously in many cases; they contain either the four primitive earths, as Mr. Bergman asserts, or calcareous earth chiefly, according to Achard: or calcareous and magnesia, according to D'Arcet. They also contain some proportion of phosphorated selenite, *i. e.* calcareous earth united to the phosphoric acid. Almost all contain also a small and variable proportion of common salt, Glauber's salt, and terrene salts, which, when in a small dose, all accelerate putrefaction; also small bits of charcoal.

Charcoal is a substance well known; it has frequently and successfully been used as a manure. 1st Young's Annals, 150, &c.

Soap-boilers' Waste or Suds forms an excellent manure for some soils; it contains, by Mr. Ruckert's Analysis, 57 per cwt. of mild calx, 11 of magnesia, 6 of argill, and 21 of silex.

Stable Dung. This is used either fresh or putrefied; the first is called *long*, the other *short dung;* it abounds in animal matter, easily runs into putrefaction, and when putrefied serves as a leaven to hasten the decay of other dead vegetable substances; *its fermentation is promoted by frequent agitation and exposure to the air: yet it should be covered, to prevent water from carrying off most of its important ingredients; or, at least, the water that imbibes them should not be lost.*

Farm-yard Dung consists of various vegetables; as straw, weeds, leaves, fern, &c. impregnated with animal matter; it ferments more slowly than the former; should be piled in heaps, and stirred, from time to time. Fern putrefies very slowly; the water that issues from it should be preserved.

Pounded Bones form also manure, much used in the neighbourhood of great towns. They gradually deposit their oily part, which contains a large proportion of animal coal which is extricated by putrefaction, and phosphorated calx. Hence Bone-ash is also useful.

Sea-weed, particularly if mixed with earth, soon putrefies and makes a good manure.

Sweepings of Ditches abound with putred matter from decayed vegetables, and hence form a manure.

Old Ditches, exposing a large surface to vegetation, contain, when destroyed, a quantity of decayed vegetables, which putrefy and make a good manure ; but in this and the former case, it may be proper to distinguish of what soil they are composed, for reasons that will hereafter appear.

Fallowing, is the principal operation by which exhausted lands are restored to fertility ; its use seems to me to consist in exposing the roots of vegetables to decay, whereby food for a fresh growth is prepared ; the atmosphere also deposits fixed air and carbonaceous substance on earth long exposed to it.

Draining is an operation equally necessary and well known, on which no more need be said here.

Paring and Burning reduces the roots of vegetables to coal and ashes ; and thus prepares both a stimulant and nutriment for plants, as will be seen hereafter. For the process of burning to make manure, the fire should be slow and smothered as in charring wood.

OF THE FOOD OF PLANTS.

To discover the food of plants, particularly of those which form the object of our present inquiry, we must examine the nature and proportion of the substances in which they grow, and of those which they themselves contain : thus we shall be enabled to see which of the latter are derived from the former.

First, All plants, (except the subaqueous) grow in a mixed earth, moistened with rain and dew, and exposed to the atmosphere. If this earth be chemically examined, it will be found to consist of silicious, calcareous, and argillaceous particles, often also of magnesia, in various proportions, a very considerable quantity of water, and some fixed air. The most fertile, also, contain a small proportion of oil, roots of decayed vegetables, a coaly substance arising from putrefaction, some traces of marine acid, and gypsum.* On the other hand, if vegetables be analyzed, they will be found to contain a large proportion of water and charcoal ; also fat and essential oils, resins, gums, and vegetable acids ; all which are reducible to water, pure air, inflammable

* Home, 15 Mem. D'Agriculture, Par. 1790. Encycloped. *Vegetation*, p. 277.

air and charcoal: a small proportion of fixed alkali is also found, some neutral salts, most commonly gypsum, tartar vitriolate, common salt, and salt of sylvius. In corn, and particularly wheat, phosphorated selenite is also found.

Hence we see that, on the last analysis, the only substances common to the growing vegetables and the soils in which they grow, are water, coal, different earths, and salts. These, therefore, are the true food of vegetables: to them we should also add fixed air, though, by reason of its decomposition, it may not be distinctly found in them, or at least not distinguishable from that newly formed during *their decomposition.*

I shall now examine the separated functions of each of these ingredients.

Of Water.—The agency of water in the process of vegetation, has never been doubted, though the manner in which it contributes to it, has not, until of late, been distinctly perceived. Doctor Hales has shewn, that in the summer months a sun-flower, weighing three pounds avoirdupois, and regularly watered every day, passed through it, or perspired twenty-two ounces each day; that is, nearly half its weight. He also found that a cabbage-plant, weighing one pound and nine ounces sometimes perspired one pound three ounces; but at a medium about half its weight.* Doctor Woodward found that a sprig of common spearmint, a plant that thrives best in moist soils, weighing only 28,25 grains passed through it 3004 grains in seventy-seven days, between July and October; that is, somewhat more than its own weight each day. He did more; for he found that in that space of time, the plant increased seventeen grains in weight, and yet had no other food but pure rain-water. But he also found, that it increased more in weight when it lived on spring-water, and still more when its food was Thames water.† From whence we may deduce that grasses and corn, during the time of their growth, absord about one half their weight of water each day, if the weather be favourable.

Secondly, That the water they thus pass nourishes them merely as water, without taking any foreign substance into the account; for 3000 grains of rain water, in Doctor Woodward's experiment, afforded an increase of seventeen grains; whereas

* 1 Hales, 9, 10, 15. † 2 Phil. Trans. Abr. 716.

by Margraaf's experiments, 5760 grains of that water contain only one third of a grain of earth.*

Thirdly, It also follows, that water contributes still more to their nourishment, when it conveys to them earthly and saline particles, as spring and Thames waters do.

The manner in which pure water contributes to the nourishment of plants, besides the service it renders them in distributing the nutritive parts throughout their whole structure, and forming itself a constituent part of all of them, may be understood from modern experiments. Doctor Ingenhouz and Mr. Senebier have shewn that the leaves of plants exposed to the sun produce pure air: now water has of late been proved to contain about eighty-seven per cwt. of pure air, the remainder being inflammable air. Water is then decomposed by the assistance of light within the vegetable; its inflammable part is employed in the formation of oils, resins, gums, &c.; its pure air is partly applied to the production of vegetable acids, and partly expelled as an excrement.

Many, indeed, have asserted, that water is the sole food of vegetables; and among the experiments adduced to prove it, that of Van Helmont, quoted by the illustrious Mr. Boyle,† is by far the most specious. He planted a trunk of willow, weighing five pounds in an earthen vessel filled with earth dried in an oven, and then moistened with rain-water. This vessel, it appears, he sunk in the earth, and watered partly with rain-water, and occasionally with distilled. After five years, he found the tree to weigh one hundred and sixty-nine pounds, and the earth in which it was planted, being again dried, to have lost only two ounces of its former weight, though the tree received an increase amounting to one hundred and sixty-four pounds.

Before I proceed to the explication of this experiment, I must remark some circumstances attending it: First, That the weight of the earth contained in the vessel at the commencement and at the end of five years, could not be exactly compared, because the same degrees of desiccation could not be exactly ascertained, and because many of the fibrillæ of the roots of the tree must have remained in the earth after the tree was taken out of the vessel, and these must have prevented the true loss of earth

* 2 Margr. 6, 70. † 2d Shaw's Boyle, 240.

from being perceived. Secondly, That the earthen vessel must have frequently absorbed water impregnated with whatever substance it might contain, from the surrounding earth in which it was inserted; for unglazed earthen vessels easily transmit moisture. (First Hales 5, and Tillet's Mem. Par. 1772, page 298, 304, 8vo.) Thirdly, As it appears that the pot was sunk in the earth, and received rain-water, it is probable that distilled water was seldom used.

These circumstances being considered, it will easily be made to appear that the rain-water, absorbed by the tree, contained as much earth as the tree can be supposed to contain.

First, The willow increased in weight one hundred and sixty-four pounds in five years; that is, at the rate of 2,7 lb nearly per month; and it being an aquatic, it cannot be supposed to pass less than its own weight of water each day during the six vegetating months. In the first month therefore, it absorbed and passed $5\times 30=150$ pounds, and as each pound of rain-water contains one third grain of earth, fifty grains of earth must have been deposited in the plant; and allowing no more than fifty grains for the deposit of each of the six months, we shall have $50\times 6=300$ for the deposit of the first year; but at the end of the first year the plant gains an accession of thirty-two pounds, therefore in each of the six summer months of the succeeding year, it passes $37\times 30=1110$ pounds of water, and receives a deposit of three hundred and seventy grains; and at the end of the second year, the deposit amounts to 2220 grains. At the commencement of the third year, the tree gaining a farther accession of thirty-two pounds must weigh sixty-nine pounds, and pass in each of the summer months $69\times 30=270$ pounds of water, and receive a deposit of six hundred and ninety grains which multiplied into $6=4140$ grains. At the commencement of the fourth year, the tree still gaining thirty-two pounds must weigh one hundred and one pounds; and if it passes $101=30$ in each of the summer months, it must gain a deposit in each of 1010 grains of earth, and at the end of the year 6060. At the commencement of the fifth year, it weighs one hundred and thirty-three pounds, and gains at the end of the six months 23940 grains of earth. The quantities of earth deposited each year exceed five pounds avoirdupois, a quantity equal to that which one hundred and sixty-nine pounds of willow can be supposed to

contain; for the commissioners employed to inspect the fabrication of salt-petre in France, having examined the quantities of ashes afforded by trees of various kinds, found that 1000 pounds of *sally*, a tree much resembling the willow, afforded twenty-eight pounds of ashes, and consequently one hundred and sixty-nine pounds should produce 4,7.* I do not give this calculation, however, as rigorously exact. It is certain that if the deposit left at the end of every month were exactly taken, the total would exceed the quantity just mentioned; but that, found even by this rude mode, sufficiently proves that water conveys a portion of earth into vegetables equal to any that the experiments hitherto made can prove to exist in them.

As to the coal, or carbonaceous principle, which this willow must also have contained, it is probable that much of it existed in the earth in which the willow grew. Some is contained in all moulds or vegetable earth; and as we are not told what sort of earth Van Helmont used, we may well suppose it was good vegetable earth, its quantity amounting to 200 lb. This principle may also have been contained in the water, for the purest rain-water contains some oleaginous particles, though in an exceeding small proportion, as Mr. Margraaf has observed;* and all oil contains coal. Some also may have passed from the surrounding vegetable earth through the pores of the earthen vessel. All the other experiments, adduced to prove that water is the sole food of plants, may be explained in the same manner. Grains of wheat have been made to grow on cotton moistened with water; each produced an ear, but that ear contained but one grain.† Here the carbonaceous substance was derived from the grain, and afterwards diffused and transported through the whole plant by the water absorbed; for it must be observed that grain, like an egg, contains much of the nourishment of its future offspring. It is thus that tulips, hyacinths, and other plants, expand and grow in mere water.

The earth contained in rain-water is united partly with the nitrous and marine acids, as Margraaf has shewn, but far the greater part only with fixed air; for the feeble traces of the two former acids could not hold in solution the 100 grains of earth which he found in 300 lb. of rain-water.

* 2d Marg. 15, 90. † 2d Young's Annals, 487.

By far the greatest proportion of vegetable substances consists of water. According to Mr. Young and Ruckert, grass loses about $\frac{2}{3}$ of its weight on being dried into hay.* Dr. Hales found a sun-flower plant, which weighed 48 ounces, to lose 36 ounces by drying in the air during thirty days†, and consequently to have lost 3 fourths of its weight. Even vegetables, to appearance thoroughly dry, contain from 3 fifths to 3 fourths of their weight of water.‡ This water is not all in a liquid state, but, by the loss of much of its specific heat, is in a great measure solidified.

Of Coal, or the Carbonic Substance. To Mr. Hassenfraz we owe the discovery, that coal is an essential ingredient in the food of all vegetables. Though hitherto little attended to, it appears to be one of the primeval principles, as ancient as the present constitution of our globe: for it is found in fixed air, of which it constitutes above $\frac{1}{4}$ part; and fixed air exists in limestones and other substances, which date from the first origin of things.

Coal not only forms the residuum of all vegetable substances that have undergone a slow and smothered combustion, that is, to which the free access of air has been prevented, but also of all putrid vegetable and animal bodies: hence it is found in vegetable and animal manures that have undergone putrefaction, and is the true basis of their ameliorating powers: if the water that passes through a putrefying dunghill be examined, it will be found of a brown colour; and if subjected to evaporation, the principal part of the residuum will be found to consist of coal.§ All soils steeped in water communicate the same colour to it in proportion to their fertility; and this water being evaporated, leaves also a coal, as Mr. Hassenfraz and Fourcroy attest.‖ They also observed, that shavings of wood being left in a moist place for nine or ten months, began to receive the fermentative motion, and being then spread on land, putrefied after some time, and proved an excellent manure.¶ Coal, however, cannot produce its beneficial effects but in as much as it is soluble in water. The means of rendering it soluble are not as yet well

* 2d Young's An. 26. 2d Ruck. 139. † 1st Hales, 8.
‡ Ruckert, 28. Seneb. Encyclop. Vegetation, 52.
§ 14 An. Chy. 56. ‖ Ibid. ¶ Ibid.

ascertained; nevertheless, it is even now used as a manure, and with good effect.* In truth, the fertilizing power of putrid animal and vegetable substances were fully known even in the remotest ages, but most speculatists have hitherto attributed them to the oleaginous, mucilaginous, or saline particles then developed, forgetting that land is fertilized by *paring* and *burning*, though the oleaginous and mucilaginous particles are thereby consumed or reduced to a coal, and that the quantity of mucilage oil or salt in fertile land is so small, that it could not contribute the thousandth part of the weight of any vegetable; whereas coal is supplied not only by the land, but also by the fixed air combined with the earths, and also by that which is constantly set loose by various processes, and soon precipitates by the superiority of its specific gravity, and is then condensed in, or mechanically absorbed by soils, or contained in dew. Lands which contain iron in a semicalcined state, are thereby enabled to decompose fixed air, the iron, by the help of water, gradually attracting the pure air which enters into the composition of fixed air, as Mr. Gadolin has shewn:† a discovery which appears to me among the most important of these later times; but these calces of iron may again be restored to their former state by union with oleaginous substances, as Mr. Beaumè has noticed: and this is one of the benefits resulting from the application of dung before it has fully putrefied.‡ Hence we may understand how soils become effete and exhausted, this effect arising in great measure from the gradual loss of the carbonic principle deposited by vegetable and animal manures, and from them passing into the growing vegetables; and also from the loss of the fixed air contained in the argillaceous part of the soil, which is decomposed by vegetables; and from the calcination of the ferruginous particles contained in the soil. I say in *great measure*, because other causes contribute to the diminution of fertility; which shall presently be mentioned. Hence also we see why lands pastured remain longer fertile than those whose vegetable crop is carried off, as much of the carbonaceous principle is restored by the excrements of the pasturing animals: why some crops exhaust more than others; because corn, and particularly wheat, contains more of the car-

* Young's Annals. † 1st Chym. Ann. 1791, 53.

‡ The affinities of coal and iron to pure air, vary with the temperature.

bonic principle than grasses, and very little of its exuviæ are left behind: why fallows are of some use; as the putrefaction of the roots of weeds and the absorption of fixed air by clays, are thereby promoted: why vegetables thrive most in the vicinity of towns; because the carbonic principle is copiously dispersed by the smoke of the various combustibles consumed in inhabited places: why soot is so powerful a manure: why burning the clods of grassy land contributes so much to its fertility, and then only when the fire is smothered and coal produced; besides many other agricultural phænomena, too tedious to relate: but I must not omit that the phosphoric acid is found in coal; and this enters into the composition of many vegetables.

The quantity of coal in vegetables is various, according to their various species, age, and degrees of perfection: wood and corn contain most, grasses least. Wiegleb found dry beech-wood to contain one fifth of its weight of coal.* Westrumb found *trifolium pratense*, a sort of clover, to contain about one seventh. Hence, after water, it is the most copious ingredient in vegetables.

Of earths. The next most important ingredient to the nourishment of plants is earth; and of the different earths the calcareous seems the most necessary, as it is contained in rain water; and, absolutely speaking, many plants may grow without imbibing any other. Mr. Tillet found corn would grow in pounded glass;† Mr. Succow in pounded fluor spar, or ponderous spar, or gypsum;‡ but Tillet owns it grew very ill; and Hassenfraz, who repeated this experiment, found it scarcely grow at all when the glass or sand were contained in pots that had no hole in the bottom, through which other nutritive matter might be conveyed. It is certain, at least from common experience, that neither grasses nor corn grow well either in mere clay, sand, or chalk; and that in vegetables that grow most vigorously, and in a proper soil, three or four of the simple earths are found. Mr. Bergman, on the other hand, assures us he extracted the four earths, the silicious, argillaceous, calcareous, and muriatic, in different proportions from the different sorts of corn.§ Mr. Ruckert, who

* Uber die alkalis, p. 76.

† Mem. par. 1772, 301, 8vo. ‡ 1st Chym. An. 1784.

§ 5 Bergman, 94, 98. Schœffer Worles, sec. 172.

has analyzed most species of corn and grasses, found also the four above mentioned earths in various proportions in all of them.

Mr. Ruckert is persuaded that earth and water, in proper proportions, form the sole nutriment of plants; but Mr. Giobert has clearly shewn the contrary; for, having mixed pure earth of alum, silex, calcareous earth, and magnesia, in various proportions, and moistened them with water, he found that no grain would grow in them; but when they were moistened with water from a dunghill, corn grew in them prosperously.* Hence the necessity of the carbonic principle is apparent.

The absolute quantity of earth in vegetables is very small. Dr. Watson informs us that 106 avoirdupois pound = 1696 ozs. of oak, being carefully burned, left but 19 ozs. of ashes; and from these we must deduct 1,5 for salt, then the earthy part amounts only to 17-5; that is, little more than one per cwt. The commissioners appointed to inspect the saltpetre manufactory, found nearly the same result; namely, 1,2 per cwt. in beech 0,453, and in fir only 0,003. Hence we need not wonder at trees growing among rocks where scarce any earth is to be seen; but in the stalks of Turkey-wheat, or maize, they found 7 per cwt. of earth, in sun flower plant, 3,7;† so that, upon the whole, weeds and culmiferous plants contain more earth than trees do.

Since plants derive some proportion of earth from the soil on which they grow, we cannot be surprised that the soils should at length be exhausted by crops that are carried off; such as those of corn and hay, particularly the former: even lands pastured must at last be exhausted, as the excrements of animals do not restore the exact quantity that the animals have consumed; and hence the utility of mucks, as the restoration is performed by more animals than have been employed in the consumption. Hence also a succession of different crops injures land less than a succession of crops of the same kind, as different proportions of the different earths are taken up by the different vegetables.

Vegetables not only require food, but also that this food be duly administered to them: a surfeit is as fatal to them as absolute privation. Doctor Hales observed that a young pear-tree, whose roots were set in water, absorbed a smaller quantity of it every day, the sap-vessels being saturated and clogged by it;

* Encyclop. Vegetation, 274.

† See 3 Trans. Royal Irish Academy.

and Mr. Miller found that too much water rotted the young fibres of the roots as fast as they pushed out.* Saturated solutions of dung appeared to Mr. Du Hamel equally hurtful.†

Fixed air. That plants do not thrive, but most frequently perish, when surrounded by an atmosphere of fixed air, has long been observed by that great explorer of the most hidden processes of nature, Doctor Priestly; but that fixed air imbibed by the roots is favourable to their growth, seems well established by the experiments of Doctor Percivel of Manchester, and fully confirmed by those of Mr. Ruckert. This last mentioned philosopher planted two beans in pots of equal dimensions filled with garden mould. The one was watered almost daily with distilled, the other with water impregnated with fixed air, in the proportion of half a cubic inch to an ounce of water: both were exposed to all the influences of the atmosphere, except rain. The bean treated with aerated water appeared over ground nine days sooner than that moistened with distilled water, and produced 25 beans; whereas the other pot produced only 15. The same experiment was made on stock-julyflowers and other plants with equal success.‡ The manner in which fixed air acts in promoting vegetation, seems well explained by Mr. Senebier: he first discovered that fresh leaves exposed to the sun in spring water, or water slightly impregnated with fixed air, always produce pure air as long as this impregnation lasts; but as soon as it is exhausted, or if the leaves be placed in water out of which this air has been expelled by boiling, they no longer afford pure air:§ from whence he infers that fixed air is decomposed, its carbonic principle retained by the plant, and its pure air expelled. It appears to me also, by acting as a stimulant, to help the decomposition of water. Mr. Hassenfraz, indeed, denies its decomposition; but his arguments do not appear to me conclusive, for reasons too tedious and technical to mention here.

Of Saline Substances. Saline substances (gypsum and phosphorated calx excepted) seem to serve vegetables (as they do animals) rather as a *condimentum*, or promoter of digestion, than as a *pabulum*, or food. This idea is suggested by the smallness of their quantity, and the offices they are known to perform.

* 1st Hales, 17. † Mem. Par. 1748. ‡ 2d Chy. An. 1788, 399.

§ Sur l'Influence de la Lumiere, and 41 Rosier, 206.

Their quantity is always smaller than that of earth; and this we have already seen to be exceeding small.

OF THE CONSTITUTION OF FERTILE SOILS, AND THE METHOD OF ESTIMATING THEIR FERTILITY.

The first essential requisite to a fruitful soil is, that it contain a sufficient quantity of the three or four simple earths above mentioned, and of the soluble carbonaceous principle. The other requisites are, that the proportion of each, and general texture of the soil, be such as to enable it to admit and retain as much water as is necessary to vegetation, and no more.

Now we have already seen that the retentive powers of moisture are very different in the simple earths: therefore the proportions in which the fertility of a soil requires them to be mixed, must be different in climates and countries that differ considerably in moisture; in the *drier*, they must be such as are most retentive; in the *moister*, such as suffer it to pass or evaporate more easily.

The same remark extends to situation. Lands on a plain should be so constituted as to be less retentive of water than those situated on a declevity; as is very evident.

Mr. Young discovered a remarkable circumstance attendant on fertile soils: he found that equal weights of different soils, being dried and reduced to powder, afforded quantities of air by distillation somewhat corresponding to the ratios of their values. This air was a mixture of fixed and inflammable airs, both proceeding, most probably, from the decomposition of water by the coaly matter in the soil.

OF THE MANURES MOST ADVANTAGEOUSLY APPLICABLE TO THE DIFFERENT SOILS, AND OF THE CAUSES OF THEIR BENEFICIAL EFFECT IN EACH INSTANCE.

Of Clayey Soils. The best manure for clayey soils is marl; in this all the books of agriculture are unanimous;* and of the different sorts of marl, that which is most calcareous is best; the silicious next best; limestone-gravel best of all; and argillaceous marl least advantageous.†

* 4th Young's Eastern Tour, 404. 1st Body of Agriculture, 104, 108.
† Ibid. 108.

A mixture of marl and dung is still more advantageous,* because the dung supplies the carbonaceous ingredient. But the marl must be used in the same quantity as if dung had not been applied, otherwise the operation must be more frequently repeated.

If marl cannot be had, a mixture of coarse sand and lime perfectly effete or extinguished, or chalk will answer the same purpose, as it will supply the defective ingredient, and open the texture of the clay ; so also sand alone, or chalk, or powdered limestone, may answer, though less advantageously. Lime alone appears to me less proper, as it is apt to cake, and does not sufficiently open the soil.

Where these manures cannot be had, coal-ashes, chips of wood, burned clay, brickdust, gravel, or even pebbles, are useful ;† for all these improve the texture, and the former supply also the carbonaceous ingredient.

Before I advance farther, to prevent superfluous repetition, I shall lay down a second general maxim ; which is, that *dung is a proper ingredient in the appropriated manures of all sorts of soils*, as it supplies the carbonaceous principle.

Of Clayey Loam. This soil is defective either in the calcareous ingredient, or in the sandy, or in both : if in the first, the proper manure is chalk ;‡ if in the second, sand ; if in both, silicious marl or limestone-gravel, or effete lime and sand.

Chalky Soil. This soil wants both the argillaceous and the stony, sandy, or gravelly ingredients ; therefore, the best manure for it is clayey loam, or sandy loam.§

Chalky Loam. The best manure for this soil is clay, or argillaceous marl,|| if clay cannot be had : because this soil is defective principally in the argillaceous ingredient.

Sandy Soils. The best manure for these is calcareous marl,¶ which exactly corresponds with our theory ; for these soils want both argillaceous and the calcareous ingredients ; and this marl supplies both : the next best is argillaceous marl ; and next to these, clay mixed with lime, or calcareous or clayey loams.

* 4th Young's Eastern Tour, 404.

† 5 Bergman, 107 ; and Young's Irish Tour, 219, 129, 136.

‡ 1st Young's Eastern Tour, 395. § 5 Bergman, 107.

|| 4th Young's Eastern Tour, 404. ¶ 4th Young's Eastern Tour, 401, 412.

Sandy Loams. These are defective chiefly in the calcareous ingredient, and in some degree also in the argillaceous; their texture too is imperfect, as they abound both in fine and coarse sand; chalk or lime would supply the first defect, but would leave the texture unamended. Hence they are used when better cannot be had;* yet calcareous or argillaceous marls are most proper.† Clay, after land has been chalked, answers, as we are told, remarkably well, because it remedies the texture.‡

Gravelly Loams. These soils are benefitted by the application of marl, whether argillaceous or calcareous,§ for reasons which I suppose are now apparent: if the gravel be calcareous, clay may be employed.|| A mixture of effete lime and clay should answer in all cases.

Till and Vitriolic Soils. These necessarily require the calcareous ingredient to neutralize their peccant acid: hence chalk, limestone-gravel, lime and calcareous marl, are most advantageously applied to them.

Bogs or Boggy Soils. When these are well dried by sufficient drains, the nature of their soil should be explored by analysis, and an appropriate manure applied. In general, they should first be burned, if capable of that operation, then gravelled. If their upper parts contain a sufficiency of the carbonaceous principle, as often happens, they need not be burned. Limestone-gravel will answer best, or lime mixed with coarse sand or gravel, because in general they are of a clayey nature; if more sandy, lime may answer well, or calcareous marl.

Heathy Soils. These should first be burned to destroy the heath, and increase the carbonaceous principle; they should then be analyzed, and the defective principles supplied. Lime is said to destroy heath, and so is lime-stone gravel:¶ this is fittest when the soil is clayey; lime when it is gravelly.** Gypsum also answers remarkably well when the soils are dry.

Of Paring and Burning. This mode of improvement is not particular to any species of soil, though poor soils that have few vegetables growing in them, will certainly profit least by it. Its advantages are,

* 4th Young's Eastern Tour, 398. † Ibid. 402.
‡ 4th Young's Annals, 413.
§ 4th Young's Eastern Tour, 404, 406. || 1st Eastern Tour, 494.
¶ Fourth Young's Eastern Tour, 395. ** Irish Tour, 212.

First, That it converts vegetables and their roots into coal. Hence it is that agricultural writers tell us, though without knowing the reason, that all violence of fire is to be avoided, and that a slow smothering fire is best.*

Secondly, That it destroys the old sickly roots, and thus leaves room for others younger and more vigorous.

Many have imagined, that it diminishes and consumes the soil; but repeated experience has shewn the contrary. I need only mention that of Colonel St. Leger, in Yorkshire, related by Mr. Young in the 1st volume of his Eastern Tour, page 182. It is well known, that clays and loams are rather hardened than consumed by heat. However, unless fresh seeds be committed, the soil will be unproductive for a number of years; the coaly principle may also be exhausted by too many crops.

Of Gypsum, or Plaister of Paris. This manure was discovered by Mr. Mayer, a German clergyman of uncommon merit, in the year 1768; it has since been applied with signal success in Germany, Switzerland, France, and America. If in England it has not been so much approved of, it must be because the calcareous principle prevails there almost universally: clayey lands are most improved by it. The time for spreading it is early in the spring, and then it is to be thinly strewed on the land at the rate of about eight bushels to the acre; more would be hurtful. The *rationale* of its effects may be deduced from its extraordinary sceptic power, for it is found to accelerate putrefaction in a higher degree than any other substance;† and hence it is not ploughed in like other manures, but barely strewed on the surface of the land.

Secondly, From its being itself no inconsiderable part of the food of many plants, particularly of clover, pulse, and corn, but the land on which it is strewed must be dry, such as would naturally suit clover, &c. otherwise it would be useless.

* First Body of Agriculture, 210, 211. † Historie de la Putrefaction, 36.

ON THE AMERICAN HEDGE THORN.

BY THE HON. JOSIAH QUINCY.

[To John Lowell, Esq. Corresponding Secretary to the Massachusetts Society for promoting Agriculture.]

Quincy, 25*th June*, 1813.

SIR,

Live hedges are objects of so much importance, in those parts of this State, where stone cannot easily be obtained; and knowing that a mistaken opinion prevails concerning the expense of this species of fence, I think it will be useful to communicate the result of an experiment made with an express reference to this point.

In March 1808, I imported 10,000 seedling thorns from the nursery of Thomas Main, near Georgetown, in the district of Columbia, of that species, which he calls the "American Hedge Thorn." These were planted in a hedge course, which, in its whole length, was two hundred and fifty-five rods; so far as was necessary, to fill that extent in one line, each plant being five inches apart. The residue were planted in a nursery for the purpose of filling vacancies, which might occur by death or accident.

The hedge course was made in sord land, ploughed of the width of four feet, and manured and prepared, precisely as if for Indian corn; except only that after ploughing, the centre, for two feet wide, was turned over with the spade. Without other preparation, the hedge was planted in April, 1808, on a level, without either bank or ditch.

As I intended this as an experiment, to test the utmost cost of a hedge destined, not for ornament, but for farm use, I directed the tenant of my farm, (Alpheus Cary of this town,) a very faithful and intelligent farmer, to make a separate charge for all the labour bestowed upon it in his account with me, and I paid, without any question, every such charge at the price he affixed; being determined that no particular economy should render the

apparent, less than the real expense. I consider the experiment now as completed, so far, at least, as is necessary for a satisfactory ascertainment of the cost of this species of fence. For the expense of the hedge, this year, has been nothing except the annual trimming. It is, upon an average, nearly five feet high; and a sufficient security against cattle, for almost the whole extent; and is every day strengthening, without any application of attention or labour.

The following is a statement of the expense:

255 rods, or 4207½ feet is 8415 plants:—say 8500 at $5 per 1000 -		-	is $42 50
Reserved in the nursery -		1500	7 50
		10,000 plants	$50
Package and freight - - -		-	3 75
Cost of the thorns at and from Georgetown		-	$53 75
Labour.	1808, April. Equal to nine days, (oxen and manure included,) breaking up and preparing hedge-course	-	$14
do	Setting-out hedge	13 days	12 92
do	May, hoeing	4 do	4
do	June, hoeing and sundries	9½ do	11 63
do	July do	7 do	7
do	August do	1 do	1
do	November do	5 do	5
	Cost of labour, &c. first year	-	$55 55
do	1809, April. Hoeing and filling vacancies - -	3 days	$3
do	May, June, July and August, hoeing 19½ days - - -	-	19 50
do	November. Treading snow, against mice, one day - -	-	1
	Cost of labour the second year	-	$23 50
do	1810, February. Cropping hedge, one day - - -	-	$1

Labour.	April and August. Hoeing and filling vacancies, 10½ days - - -	10 50
	Cost of labour the third year -	$11 50
do	1811, February. Trimming hedge, one day - - - - -	$1
do	April and August. Hoeing, 7 days -	7
do	Sundries - - - -	1 13
do	November. Trimming hedge, 1½ days	1 50
	Cost of labour the fourth year -	$10 63
do	1812, April. Hoeing 7 days - -	$7
do	August do 4 do -	4
	Cost of labour the fifth year -	$11
do	1813, February. Trimming the hedge, two days - - -	$2
	Whole cost of labour, &c.	$114 18
Whole expense of making 255 rods of hedge fence		$167 93

There is no longer any labour necessary, and only general attentions, of a nature not worth an estimate are requisite.

From the result it appears, that two hundred and fifty-five rods of hedge fence, has cost *less than sixty-six cents a rod;* notwithstanding no particular attention was paid to economy in executing the work, and the whole was paid for at the cash value of labour. I have no doubt that where the labour is performed by the farmer himself, and those facilities adopted which experience and the usual attention of practical farmers would suggest, that a complete thorn hedge might be formed, in six or seven years, sufficient against every ordinary danger, for an expense *far less than fifty cents a rod.* Practical farmers, in this neighbourhood, are of the same opinion. The prejudice which was very strong in this vicinity, against the success of the experiment, is in a great measure removed. Several farmers have declared themselves satisfied. One or two have determined to commence a course of hedging as soon as plants can be procur-

ed, and have actually taken measures for this purpose. I mention this fact, because the opinions of intelligent practical farmers are justly of more weight with practical farmers, than are the opinions of men whose habits of life do not lead them to a direct participation in the labours of agriculture.

The course best to be adopted, having reference to the economy of labour, is thought to be the following:

Plough the hedge course *six feet wide*. Plant the whole course one year to potatoes. This pays for the labour as much as other land thus planted. Set the thorns *eight* inches apart. This is near enough in a country like this, where hogs are not permitted to run at large, and makes a considerable saving in the labour as well as in the cost of the plants. Keep both sides of the hedge planted to potatoes, during the whole six years in which the hedge is coming to perfection. The potatoes will nearly pay the cost of the labour. The manure for the potatoes benefits the hedge; and while hoeing the potatoes, keeping the hedge clear of weeds is easy.

To keep the hedge clear of weeds, and to fill up the vacancies regularly, in the spring of every year, with plants of the same age with those of the original hedge, are the two essential objects of attention after the hedge-course is prepared and the plants are set. Younger plants may answer, but whoever would make a hedge, in the most speedy and perfect manner, ought to procure at the time of obtaining the plants for the original hedge, a sufficient extra number to supply all deficiencies likely to occur, through the whole time the hedge is forming; to be kept in a nursery thriving, if possible, a little better than those in the hedge-course. Experience has satisfied me, that *two* for every *ten* planted in the hedge-course, is a number more than adequate for this object.

In the statement of expense, I have made no allowance for *protecting fences*. Where these are necessary, their expense must be added. In my experiment, by excluding cattle, the necessity for them was obviated. Whatever these may cost, the economy of this species of fence, when its durability is taken into view, (to say nothing of its ornamental nature,) must be sufficiently apparent.

Very respectfully,

I am your humble servant,

JOSIAH QUINCY.

CULTURE OF LONDONDERRY WHEAT,

NEAR BOSTON.

BY MR. DUDLEY HARDY.

[To Gorham Parsons, Esquire.]

DEAR SIR, *Brighton, September* 2, 1813.

By your desire I give a statement, but a very awkward one, as I am not much in the habit of writing. The wheat which I raised this year is as follows: I sowed twenty-eight quarts of wheat on three quarters and an half quarter of an acre of land, as nearly as I could ascertain. As to the land on which I raised my wheat, it was on three kinds of soil. The first was high and moist; the second much drier; the third was sandy and very dry, and very thin on the two last pieces. The wheat on the last was not so good and large, but the kernel nearly equal for goodness. I put on one buck load of manure on the weakest part of the land—This land was planted with indian corn the last year. I ploughed my land in the fall, and in the month of March following I began to plough it over again, before the frost was all out of the ground, two or three times, and then harrowed it with an iron tooth harrow; then I prepared my grain by steeping it in lye made of ashes for twenty-four hours; then on the seventh day of April I sowed my wheat, and harrowed it in with the same harrow. After this I bruised the ground smooth with a brush harrow. The twenty-eight quarts of wheat as above, produced eighteen bushels. I have weighed a number of bushels of said wheat, and it gave me sixty pounds per bushel. I have had one bushel ground and bolted, which gave me forty-six pounds and an half of flour. I purchased the wheat of a Mr. Webster of Bradford. As to the mode of raising this grain, I learnt it of Capt. Ellery and an old gentleman from Londonderry in New-Hampshire, and a gentleman from the upper part of this State, all in the habit of raising wheat. I believe the chief difficulty lies in not sowing it in the month of March. I should have sowed mine much sooner than I did, but the frost prevented.

From your most obedient and humble Servant,

DUDLEY HARDY.

ON THE FIORIN GRASS.

BY JOHN WINTHROP, ESQ.

[To the Hon. John Adams, Esq.]

SIR,

WITH your permission, I beg leave to communicate to the very useful and highly respectable Society over whom you preside, some facts and observations relative to a grass lately brought under cultivation in Ireland, and with great success by the Rev. Dr. Richardson of Clonfide. Having noticed, about a year since, several Essays printed in the Edinburgh, British, and other Reviews, highly extolling the properties of the Fiorin Grass, and stating the *prodigious* quantity of its produce, I was induced to address a letter to the Rev. Dr. Richardson, requesting information on the subject. Through the politeness of Mr. English, our consul at Dublin, my letter was immediately forwarded, and Doctor Richardson has done me the honour of answering it, and also sent me a small bundle of the Fiorin strings, which were cut on the 23d of March, and which I put in the ground on the 10th of May.

The Fiorin is an indigenous grass in Ireland. The term is Irish and signifies a plentiful grass; it has also been lately discovered growing on some moss grounds in Scotland. The grass of which the famous "Orchestran meadow" in Wiltshire, England, consists, is principally of this description, and without any analysis of its peculiar properties, has been long considered as the most productive of any ground of equal extent in England.

(1) A late publication enables me to mention the amount of produce of that meadow, which consists only of two acres and an half, and the tithe of which has been compounded with the clergyman of the parish for £9 sterling per annum; this makes (a fair estimate) the produce of the meadow equal to £90, or £36 sterling the English acre, which very far exceeds the produce of any other crop known in England. From the above statement of the various situations in which this grass has been found, it will be at once perceived, that Doct. Richardson claims no merit

for its original discovery, but has the most unqualified claims to our approbation and gratitude for bringing it into cultivation, and for the high reputation it has acquired under his direction and patronage.

In a climate like ours, subject to such long and extreme winters, it becomes an object of primary importance to procure such food for our cattle, as is not only nourishing at the time we first house it, but has the power of retaining its saccharine properties for the greatest length of time. The Fiorin appears to possess this property in an eminent degree, and from various documents in my possession, it appears to have been preferred by cattle, after it had been cut *six months*, to new mown clover; and Doct. Richardson observes, that it possesses the peculiar quality of imparting to milk the same sweetness as green succulent food; and of course butter made from this hay is not subject to that bitter and rancid taste from which, in this state particularly, we suffer so much. In confirmation of the above, I copy the certificates of Lord Viscount Northland, and the Rev. William Jones Armstrong, men of the first respectability:(2) "We carried some dry Fiorin hay," said they, "from the field to the stable, and first offered Lord Northland's horses some common hay which they ate freely, they were then tried with the Fiorin hay, which they seized greedily, and always after rejected the common hay when offered to them, looking about for the Fiorin."

Mr. Harish, a celebrated agriculturist, who has written an Essay on this subject, mentions the decided predilection of every animal to this food. (3) "He says, "In the end of May last, I brought in a small sheaf from the field, which had stood uncut through the whole season, and appeared white and withered. This lay in the room of Mr. Millar of Dalswinton for some days, which increased its dead appearance; Mr. Millar then went to his stables, and caused the coachman to present a part of this sheaf, along with a parcel of fine, sweet clover hay, to every horse; who not only ate Fiorin with great relish, and sought with apparent eagerness for more when it was done, but *refused* the clover altogether."

(4) Mr. Alexander Young asserts a similar fact as experimented by himself, and adds further, "that he tried it with sheep while lambing, and they ate it greedily."

(5) Mr. Robert Ainslie, who has written largely on this subject, and who, next to Doct. Richardson, has cultivated the Fiorin with the greatest success, gives it his decided approbation, as being vastly superior, in its *nutricious* as well as *productive* qualities, to all other grasses known in Europe. I presume sufficient authorities have been quoted from the written and printed declarations of *practical* farmers, both in England and Ireland, to prove the superiority of this species of food over all others, as evidenced by the preference given to it by horses, horned cattle, and sheep, and even after it had been exposed to the alternate vicissitudes "of heat and cold, moisture and drought, for a whole season."

It will now be desirable to enquire on what soils it has been cultivated with the greatest success, and what produce it has given to the acre. In answer to the first enquiry, it has been already shown, that the Fiorin is a natural grass on marshy lands and mosses, and in this description of ground it is recommended chiefly to cultivate it. (6) Doct. Richardson states, in a letter to Sir James Stuart, that he cut his peat in summer, and grew the Fiorin in winter, both within the space of less than *one* year, and on the same piece of ground. The same gentleman, in his letter to me, after requesting information respecting the climate and soil of our part of America, observes: "Now a luxuriant grass for hay, which sustains drought, and is no more injured by the frost and snow (meaning in Ireland) than the paving stones, must be a treasure to America; and my proofs of its uncommon value are increasing daily, and my last crop far exceeds any of the preceding." This letter is dated the 23d March, 1812.

(7) Mr. Millar of Dalswinton near Dumfries, a large landholder, and who has cultivated the fiorin successfully, though at first opposed to it, states in his letter to the Agricultural Society of Ireland, "That this grass will grow upon every soil, and may be laid down at any time of the year." He prefers laying down in the months of September, October and November. Mr. Millar also fully confirms the statement of other gentlemen, relative to the strong vegetating principle which this grass possesses. The *soil*, however, on which it grows most luxuriantly, and for the reclaiming of which it is most wanted, is our meadow and marshy grounds, annually overflowed, and from which we cut that miserable kind of hay known by the name of *swail;* pos-

sessing the least nutriment of all our grasses, and generally combined with coarse sedge, rendering it the poorest sustenance which is used for winter feeding.

To shew of what vast importance the Fiorin would become for reclaiming such lands, I will with your permission state a few facts relating to some moss and peat land reclaimed in Ireland and Scotland.

The first is from Dr. Richardson. (8) A portion of ground, says he, (he does not exactly say meadow, but from what follows the inference is strong) laid down with Fiorin late in August, 1806, and twice mowed in 1807, and not *manured*, produced six tons the English acre; and a portion laid down November 15th, 1806, once mowed in 1807, and *tolerably manured*, produced in 1808, *seven tons, four hundred, one quarter and eight pounds* the English acre.

Mr. D. Millar of Dalswinton, whom I have before mentioned, makes the following statement to the "Irish Agricultural Society," and published by them, viz. That he had laid down eighteen acres on different kinds of soil, and so great had been his success, that he intended to lay down in the course of the year two hundred acres more, and that the whole two hundred acres he had been in the habit of letting to tenants at a yearly rent of one shilling an acre; but in consequence of the following experiment made on a peat bog near his house, he had been induced to take the land into his own cultivation. (9) A peat bog containing thirteen acres, from which peat had been dug many years, and had been let at thirteen shillings per acre, he brought into Fiorin with the spade, it being too wet to work with horses. Mr. Millar represents the process as tedious and expensive, insomuch that it actually cost him £330 sterling to lay it down in Fiorin; but so great was its produce, that he expressly declares, on a lease for nineteen years, he would not rent it under £200 sterling a year; and further, that if he kept it, and took the labors of the tenants on himself, he was confident of making £300 a year from it.

Sufficient evidence has, I presume, been exhibited in the statement above quoted, to warrant a belief, that by a judicious and early attention to the cultivation of the Fiorin, a vast surface of useless meadow may be made infinitely more valuable than our best and highly manured mowing grounds, and that not only

for *one*, *two*, or *three* years, but that a lasting benefit will be ensured. (10) For from Dr. Richardson's letter, it appears that his crop has been continually improving since 1806, and that too, with a very limited use of manure. Another great advantage experienced in Ireland, has arisen from the use of green food for cattle during the whole winter. In order to ascertain this fact, Dr. Richardson advertised that he would mow his Fiorin on the 1st and 15th of every month from October to February. He accordingly did so, and strangers (11) (some of the highest distinction) attended at different times, and examined the hay previously cut, were satisfied of its excellent quality, and notwithstanding the severity of the winter, found it in the best condition.

(12) Sir John Sinclair caused a small plat of it to be cultivated near the new town of Edinburgh, cut it early in the winter, and allowed it to remain uncovered, merely putting it into cocks. It did not however rot as other hay would have done in a similar situation, but remained perfectly fresh, and Mr. Ainslie states that he knew the hay offered to horses after having been thus exposed, and they ate of it with the utmost relish.

Before concluding this essay, I will beg permission to illustrate the uncommon nutricious properties of this grass in feeding *sheep*, an animal, which at the present moment, has become very interesting to Americans. The above mentioned Mr. Millar fed seven sheep constantly with Fiorin, with no other addition than about a pound of potatoes a day to each sheep, reckoning that seven-eighths of their nourishment had depended on the Fiorin: he has killed them from time to time, and found them not only fat, but the mutton of an excellent flavour and taste. (13)

Perhaps it might be well to observe, that Dr. Richardson has most kindly offered to furnish such directions as will enable us to cultivate the Fiorin successfully, notwithstanding the great extremes of heat and cold, to which our climate is subject.

The Doctor has requested me to send him a particular account of the monthly average temperature of our atmosphere, and also of the soils on which we should probably cultivate his grass, as a preliminary step toward his promised publication.

If, Sir, you will do me the honor to communicate these facts and observations to the society, and they should meet their approbation, I will, with great pleasure furnish any information I

now, or may hereafter, possess on its particular mode of cultivation.

I have the honor to be, Sir,

Your's most respectfully,

JOHN WINTHROP.

Dorchester, *May* 23*d*, 1812.

AUTHORITIES QUOTED.

(1) The first number of the "British Review" is quoted by Mr. Robert Ainslie, in his memoir to the Agricultural Society of Ireland.

(2) Printed in the publication of the Cork Institution, and published under the sanction of the Agricultural Society of Ireland.

(3) Mentioned in the Munster Magazine for January, 1812.

(4) Writer to the Signet.

(5) Mr. Ainslie's Memoir to the Agricultural Society of Ireland, continued from page 245 of December publications.

(6) See Dr Richardson's letter as published by the Cork Institution.

(7) Published in the Dumfries Journal.

(8) See letter quoted in No. 6.

(9) See letter quoted in note 7, published in Dumfries Journal.

(10) Dr. Richardson's letter to me, of 23d March, 1812.

(11) Marquis of Headfort.

(12) See Robert Ainslie's Memoir, Note 5.

(13) See letter referred to in Note No. 7.

SUGAR FROM THE BUTTERNUT TREE.

BY MR. MOSES P. GRAY.

[To Gorham Parsons, Esquire.]

Epsom, *May* 15*th*, 1813.

DEAR SIR,

I SEND you the so long promised sample of sugar; we tapped four oil nut trees of from eight to ten inches diameter at the but, which produced in one day nine quarts of sap, that made one and a quarter pounds of sugar. The trees were at a distance from home, and belonged to Mr. Jonathan Pearson, who assisted me in the process; having no rock maple trees any where within my reach, I was prevented from making an

experiment which I much wished, to see what would be produced from the like number of trees of equal size. The allowance here made is three gallons of maple sap to make one pound of sugar, whether that is perfectly correct I do not know, but I believe so.

I am yours, sincerely yours, &c.

MOSES P. GRAY.

It appearing from the above experiment, that the butternut tree will give as much sugar from its sap as maple, the Trustees are induced to recommend a critical trial on the white walnut. If the sap will run, it will probably yield a greater quantity of saccharine juice than any tree in the country. It is a well known fact that as the warm weather comes on in the Spring, the ends of the trees that have been cut the previous winter, will discharge a considerable quantity of rich juice resembling honey.

ON THE TALL MEADOW OAT GRASS.

BY JUSTIN ELY, ESQ.

[To Dr. Aaron Dexter. M. D.]

West Springfield, May 24th, 1813.

A NEW kind of imported grass seed has lately been received here from New York, called the Tall Meadow Oats, which is said to be preferable to any other grass in the United States. It is described by Dr. Henry Mulenburg of Lancaster, in Pennsylvania, as follows :

" This grass is of all others the earliest, latest, and best grass for green fodder and hay ; it blossoms about the middle of May with red Clover, and the seed ripens a month after. It grows best in a Clover soil, and rises to a height of from five to seven feet—it ought to be cut for hay in blossom, about the end of May. The seed may be sown in the fall or spring, with or without grain, and must be brushed in or lightly harrowed. If mixed with Clover, it will make good upland meadow. Horned cattle prefer this grass to all others, but some horses do not relish it green. It must be pastured or cut at least three times in a sea-

son. If suffered to grow old, it will become straw like: when intended for hay it must be salted."*

A few years since I procured a bushel of the seed, but it almost wholly failed. I have lately procured from Thornburn's seed store in New-York some good seed, which I have planted, and it has come up well—our horses are very fond of it green. It ripens so early, the seed will shell out and be lost, if not carefully attended to. The seed sown in May or June, may produce seed the next fall; if not, it will be prepared to seed next June. It is said it will do well for ten years or more without ploughing it up.

I take the liberty to send you herewith a quart of the seed, and request you to distribute it, in small quantities, among the members of the Society, if any should wish it. It is commonly sown in rows in gardens the first year; half a gill or a gill will be sufficient to begin with. It is said to be spreading fast in the State of Pennsylvania, and the neighbouring States; it will be forwarder there than in Massachusetts. It was imported from Germany, and will undoubtedly flourish in any part of the United States. If it answers the description, it will be a valuable acquisition to the country—but perhaps you are already supplied.

I am, with respect and esteem, your humble Servant,

JUSTIN ELY.

ON THE CULTURE OF TREES.

[Extract.]

In vain do we plant trees of any kind, if cattle are admitted among them; even old trees are injured by their rubbing against them, but young ones are ruined. Every planter ought to raise his own trees, that the removal may be easily effected without the roots becoming dry, and that the tree may be continued in nearly the same kind of soil and atmosphere in which it originated. Trees should never be taken from nurseries in large towns to be cultivated in the open country, as the difference of warmth in the air will much affect their growth. Too much care cannot be taken in having the holes dug large, that the young shoots

* Willick's Domestic Encyclopedia, Amer. Edit. Vol. II, part 2, page 194.

may not be injured, but pass easily through the loose mould. Let such trees as are tall be cut down close to the ground, to prevent their being shook by the wind, and to promote their growth. It may seem strange to advise the cutting down a tall well grown plant, yet it is necessary; for the roots are always hurt and shortened by the removal; it is impossible for those that remain, to nourish the same body; this is the reason we so often find our trees dead at top and hide-bound.—Should my directions be followed, which are from thirty years experience, such vigorous shoots will spring up as will in ten years become much larger trees than if they had stood uncut for forty years, and the bark and every appearance of the tree will be like one from the seed, and much trouble will be saved in staking, to prevent their ruin from the wind. Almost every kind of forest tree will do best by cutting down as soon as planted. The food of every plant seems wisely to be scattered over the earth, but particularly of trees. Many trees of different kinds will grow on an acre of ground, when the same number of one sort would be starved. Every attentive gardener knows, that a Peach tree will not do well where an old Peach tree stood, unless it be directly from the old roots, but a Pear or a Cherry will do well in the same spot. The same observations may be made with all other trees. If several shoots appear from the stump of your cut-down tree, all should be taken away but the strongest.

Great attention should be paid with fruit-bearing trees; those that bear bad fruit should not be suffered to grow with those that bear good fruit. It is well known to gardeners, that the blossoms of the Cucumber will spoil the flavour of Melons that grow near them. The same thing takes place with trees that bear fruit.

To bring an orchard as early as possible into profit, plant common wild trees, or what are commonly called Crab Apples, four or five years old.

They should be cut down as soon as planted, and on their young shoots graft or inoculate such fruit as is desired; from this practice more fruit will be obtained in ten years, than in the usual method in twenty years.

The wild tree if grafted on its own stock will come much earlier to bearing fruit, and it will be much improved in size and flavour.

ON A SPECIES OF URTICA,

AS A SUBSTITUTE FOR FLAX AND HEMP.

BY CHARLES WHITLOW.

[To the Corresponding Secretary.]

SIR, *New-York, October 26th*, 1812.

I HAVE discovered a new herbaceous plant, which promises to be superior, as a staple article, to Hemp or Flax: you will see a particular description of it in the Baltimore Medical and Philosophical Lycæum, Vol. I, No. 4. I have sold one hundred roots and one thousand seeds to the Agricultural Society of South Carolina, with the privilege of raising and manufacturing the product of fifty acres yearly, during the term of my patent, for the sum of three hundred dollars—I now give your Society the same offer. Should it be inclined to agree with my proposal, you had better send on immediately; as I expect all the seeds and roots that I now have, will be disposed of in four weeks from this. You will see a description of the plant, with all the experiments made on it by the Mayor and Corporation of New York. It is a perennial plant—the roots may be divided to ten or twenty every year. It will produce five hundred fold from seed. Dr. Foster will give you any information you may want.

CHARLES WHITLOW.

The above communication was committed by the Board of Trustees, to John Lowell, Esq. and Mr. Professor Peck. The subjoined Letters from the latter gentleman, comprise the report of the Committee.

[To John Lowell, Esq. Chairman, &c.]

MY DEAR SIR, *Cambridge, 23d December*, 1812.

I wrote to Dr. Hosack, but as yet have no answer. Professor Mc Kean has furnished me with a news-paper containing the report of the committee of the Corporation of New-York, and

the opinion of Mr. Baldwin of Vermont. These only tend to prove that the fibrous portion of the Nettle in question may be wrought with as much facility as Flax or Hemp. There is no information as to the mode or expense of cultivation. It would be gratifying to see a comparative statement of the expense of cultivating, say an acre of Flax, Hemp and Nettle. If the latter has any superiority over the two former, it is only in its having a perennial root; but as it increases by the root, the tubers must be separated, and this part of its culture may demand as much time and labour as will make it as expensive as either of the former which require no such care.

That the Nettle may be used as Flax is no new discovery. A German writer on economical botany after mentioning the three species Urtica Diöica, Urins and Pilulifera, which are native in that quarter of Europe, observes that the stalks of these are very nearly as fibrous as Flax and Hemp,and after being rotted, broken and hackled, may be used in the same way, but does not say they are better.

A species of Nettle is used in Scotland for making a coarse kind of linen, and the Urtica Cannabina, a Siberian species, is used in France, and perhaps in other parts of Europe. Hemp is of the same natural order with the Nettle, so is the Hop, and the Broussonetia a paper mulberry, from the inner bark of which are fabricated the paper garments and exquisite cordage of the savages of Otaheite and other islands of the Pacific ocean.

The fibre of the Hop is said to be as good as the Nettle, and longer than the Hemp. This is manufactured in some of the northern districts of Sweden.

All this is but little to our purpose; yet it is not entirely unconnected with it, as it states that experiments have been made with a variety of filaceous plants, and none of them have superseded those commonly in use. Whitlow's Urtica may be better than any of them, but of this we have no satisfactory evidence; and I would wish rather to leave it with yourself and the Board of Trustees to decide, whether it may not be better to wait to know the result of experiments which will probably be made the next year, before the purchase of the patent is determined on, than to advise to such a step at present.

I am, my dear Sir, with affection and respect,

Your obedient Servant,

W. D. PECK.

Cambridge, 25th February, 1813.

MY DEAR SIR,

In a note which I addressed to you before the meeting of the Trustees of the Agricultural Society, in December, I observed that the application of Nettles and other plants of the same order to the purposes for which Hemp and Flax are used, was not new in Europe and Asia. I have been informed since, that when the subject of the Urtica Whitlowi was before the Legislature of New-York, some of the members stated to the Committee, that "the plant had long been known, in the neighbourhood where Mr. Whitlow found it; that it had been frequently used for making thread; but that it had been lately abandoned as wanting strength." It appears hence that Mr. Whitlow was not the first to discover, or to apply it to this use.

It was also stated, "that the process of rotting the plant, really rotted the thread." I should judge, from the specimen enclosed in his letter to you, that this process must be managed with great nicety.

Dr. Hosack writes me that he has not, himself, examined it; but from the information he had received from Dr. Eddy, he believes it merits the character (I understand the *good character*) given of it, and that the testimony of the workmen in thread in New-York is certainly in favour of it.

Dr. Hosack obligingly enclosed me a botanical account of the plant by Dr. Eddy, who observes, "that its natural soil is low, wet meadow ground, near rivers and creeks in Orange County, New-York, and Sussex County, New-Jersey, but that it will grow well in a rich upland loam. It will yield from the hatchel for common use, at least sixty-five per cent. It has been spun into six hank yarn, valued at eleven dollars per pound, and then yielded at least fifty per cent. It can also be made into ropes and cordage by being swingled only, and *thought* to be stronger than Hemp. It will yield a thousand pounds to the acre in its natural soil, (by estimation) only broken and swingled, and five hundred pounds when dressed fine enough for six hank yarn."

These are all the testimonies in its favour which I possess, and these have probably been given to the public in the papers, which I have not seen. The product is by *estimation* and in its native soil. But some experimental knowledge of the value and

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product of this plant is necessary, before the farmer will venture to try it as a crop. In the rotation of crops, every plant, except that which is intended to occupy the ground, is considered, and is, in fact, a weed, as whatever it may be, it tends to diminish or deteriorate the crop with which it is mixed. If the farmer should try this Nettle, and find it not to answer his expectation; and if it should increase from ten to twenty fold, by its *perennial* roots, and five hundred fold, from the seeds, as Mr. Whitlow in his letter says it will, it may be rationally inquired, how is he to free his soil from so prolific and so pernicious a tenant as this would prove? For it is important to the farmer to have his ground effectually freed from a preceding, as it is perfectly to occupy it with a succeeding crop. I am therefore induced to think that the *annuals*, Hemp and Flax, for the purposes to which they are applied, cannot be superseded by the plant in question, till its claims to superiority are substantiated by decisive experiments on a large scale.

I am, dear Sir, very respectfully,

Your obedient Servant,

W. D. PECK.

THE FOLLOWING LETTER CORROBORATES THE ASSERTION ABOVE, THAT THE APPLICATION OF SOME SPECIES OF THE NETTLE TO THE USES FOR WHICH MR. WHITLOW RECOMMENDS HIS URTICA, IS NOT NEW.

East-Andover, District of Maine, October 18, 1813.

SIR,

Early in the spring of 1811, Capt. Samuel Poor of this town, discovered on his interval something resembling the coat of Flax. It appeared uncommonly strong, considering it had lain out all winter. Enough was collected to spin a number knots of thread; it spun well and appeared strong. The next spring some pains were taken to ascertain the plant, but without success. Some time the last year we saw some accounts published of a discovery said to be a substitute for Flax, and was called the *Urtica Whitlowi.* Knowing that the Nettle grew spontaneously on our wild low land, by observing this last spring, we found the old stalk of the Nettle covered with a strong Flax-like coat, and at the root of which sprung up the young shoot of one of our most common species of the Nettle. Some of which, (among bushes and other

weeds,) grew this summer upwards of five feet high. We also find that the Indians about us have been in the habit of using it for their "tump" lines and cords, and that it grows in the wilderness. It grew this summer in bunches on our interval with our clover and other grasses, and appeared to spring from the roots of the last year's stock.

We have inclosed some of the seeds with the leaf, and some that was taken from the last year's stock, and also some we put into the water to rot. It lay in dead water in a very hot place eleven days, and when taken out appeared quite too rotten, which we imputed to the small quantity and warmth of the water. We then let it lay on the ground seven days and dressed it out, some of which we have inclosed, marked A. Whether it can be improved by cultivation, and whether it will be worth cultivation, time must determine. If, gentlemen, you should think a further investigation of the subject of any importance, and will give us some direction or information on the subject, (as we have not now the short account published in our Newspaper,) we shall take it as a favour.

We have been, for these few years past, trying to raise an orchard, but have made but little progress, owing in part to our severe winter, and in the summer to a small green insect resembling lice. The lice are *constantly* attended by the small pismire, which appears to nurse them, and as some suppose to produce them. Is there any method yet discovered to protect the trees from blasts of the winter, or the devouring insects of the summer?

We have an excellent country for the cultivation of sheep, and are just beginning to raise the merinoes. We, however, have no experience; we know not the disorders to which they are liable, nor the remedies. Is there any late and approved Treatise on the subject? Where can they be had and what is the price?

We are, gentlemen, with the highest respect,

your obedient servants,

By order of the Trustees of The East-Andover Agricultural Society,

EBEN POOR, *President.*

ON THE CULTURE OF CARROTS,

AND THE USE TO BE MADE OF THEIR TOPS.

The following papers having found admittance into the most respectable agricultural publications in Great-Britain, and the facts stated being of great importance in the economy of agriculture, we thought it our duty to lay them before the publick. We do not know whether the citizens of this State at large, precisely apprehend the character of the publications of the Massachusetts Agricultural Society; they are intended chiefly to promote what, we fear, we have been too deficient in throughout our country, a spirit of inquiry and investigation.

While we could wish never to advance opinions, or encourage statements of agricultural precepts which are not founded in experience, we feel ourselves obliged to give to the publick any ingenious experiments or speculations which promise to be of publick utility.

To wait in every case until experiments shall have been made in our country, before we lay before the publick the discoveries or pretended improvements in other parts of the world, would be a policy too cautious for the interests of agriculture.

It ought not to be overlooked, that but a very few of our citizens have access to the European publications, and the limited number of the Trustees of this Society forbids the expectation, that they should make all the experiments suggested by a million of ingenious men who are employed in England, France, and the rest of Europe, in making valuable discoveries in this most useful branch of human knowledge.

We have thought that we could not do a more acceptable and useful service to the State, than by laying before the citizen-cultivators of this State, such experiments and remarks of European cultivators as should seem to promise any important advantages to the agriculturalist. With this view we have selected among some others the following, because we are well convinced, that a much more extended cultivation of the Carrot would be extremely useful and profitable in our country. There are but

few plants which will stand the severity of our frosts. The Turnip, so important to the raising of sheep in England, cannot be left in our fields as winter fodder. But the Carrot, after being used till the frost shall close the ground, may be used as soon as the spring opens without any labour for its preservation. Perhaps it would not be amiss, though not absolutely necessary, to cover the beds with a thin coat of sea-weed or any other litter.

If to the other advantages derived from raising Carrots, proved beyond doubt to be one of the most profitable crops which can be produced, you could be certain, as the following communication would seem to shew, that their tops prove an admirable fodder for milch cows, without materially impairing the amount or value of the crop, it would, without question, be the most valuable plant which the farmer could possibly cultivate.

On this point, however, we not only have our doubts, but we are almost incredulous. Our doubts, however, ought not to prevent our laying the speculation and experiments before the publick, in order that ingenious and enterprising farmers may be induced to make the experiment.

Our doubts arise partly from this experiment's thwarting all the received theories on the subject of the growth of vegetables, and partly from some facts and experiments which have a great analogy to those now communicated, and which had an opposite result.

Upon the modern and now fully established notion of the manner in which vegetable circulations are carried on, namely, that the sap ascends in the centre of the plant, and descends through the bark, an opinion now rendered not only certain, but very familiar in our own country by the practice of girdling the vine in order to accelerate its maturity, it would seem to us, that the cutting off or destruction of the branches or leaves of a tree, or the green part of a plant, must most essentially impede and check, if not destroy, its growth. Such we see every day to be the effect of the destruction of the leaves of trees by caterpillars, and the various larvas of numerous classes of insects.

That the Carrot should be an exception to this rule, appears to us improbable.

A similar opinion prevailed with respect to the Potatoe. One of the Trustees of this Society made a fair experiment this summer on this point. He planted two rows of Potatoes. When

they were about two feet high, he cut one off with the scythe. They were equally well situated and treated, and in an highly cultivated garden. The one which was not cut produced a tolerable crop; the other scarcely any. The value of the tops, had they been good fodder, would not have balanced the loss upon the roots. Still the allegation in the succeeding paper is so positive, the question of so much importance, that if as good a crop of Carrots can be obtained, and the milch cows of a farm also supported during the summer on the tops without pasturage, the gain in a grazing country, or one which raises cattle, would be immense. Very interesting, indeed, is it to us now, when our farmers will, many of them, wish to fill their pastures with Spanish sheep, and yet would hardly be willing to relinquish their dairies. In a State where the inhabitants are so generally intelligent, there must be many who, upon reading the two essays on the culture of the Carrot now published, will be willing to devote one acre to the experiment, and to try it both by cutting and not cutting their tops. The result of any such experiments will be gratefully received by this Society, in the natural, simple, unaffected language of a farmer.

FROM THE RETROSPECT OF PHI. CHEM. AND AGRIC. DISCOVERIES FOR 1811.

Mr. Burroughs having considered it an object of national importance, to diminish the quantity of land necessarily employed in producing food for sheep, horses, and horned cattle, set about raising Carrots, and the success with which his practice was attended, induced him to communicate the result of his experience to The Board of Agriculture.

His mode of cultivation is to appropriate the seed from eight to ten pounds per acre; and having weighed the seed, and collected *fine sand* or *fine mould*, he mixes this quantity of seed with two bushels of the sand, about a fortnight or three weeks before the time he intends sowing, taking care to have the heaps turned over every day, and the outsides sprinkled with water each time of turning them, that every part of the sand heaps may be equally moist, and that vegetation may take place alike throughout, and during this time the land is preparing with a good dressing of manure, of sixteen large loads to the acre. He ploughs the first

time in autumn, and the second time in the early part of the month of February, if the weather permits, carting on the manure at the time of sowing, which is about the last week in March, or sometimes as late as the second week in April; but early sown crops are generally the most productive.

In consequence of the seed being prepared beforehand, it is in a state of forward vegetation, and therefore lies but a short time in the ground, and by quickly appearing above ground, is more able to contend with those numerous tribes of weeds in the soil, where seeds are of quicker vegetation. In about five or six weeks the Carrots are ready for hoeing, and this operation is performed three and sometimes four times, or until the crop is perfectly clear; the first hoeing is with hoes four inches long, and two and a quarter inches wide; the second, which invariably takes place as soon as the first is completed, with hoes six inches long, and the same width as the former; and the Carrots should now be left at least nine inches apart from each other. After the hoeing no expense attends the crop till the taking up, which is usually about the beginning of October. They are given to the cart horses at the rate of about seventy pounds weight of Carrots to each per day, some being sliced in the cut chaff or hay, and the remainder given whole at night, with a small quantity of hay in the racks; and horses kept in this manner are found to enjoy uninterrupted health, and to do as much work as when kept wholly on corn and hay; and in this way an able Norfolk team horse fully worked two journies a day, winter and summer, may be kept the entire year round upon the produce of only one statute acre of land.

This gentleman has also applied Carrots with great profit to the feeding of hogs in winter, and by that means has made his straw into a most excellent manure, without the aid of neat cattle; and has likewise tried a successful experiment in feeding four Galloway bullocks with Carrots, against four others fed in the common way with Turnips and Hay.

The taking up of the crop is performed with three-pronged forks, and the tops are cut off and laid in separate heaps from the roots, ready for carting; but no more is taken up in autumn than to have a store, to last out any considerable frost or snow that may happen in the winter months; the rest of the crop is left in the ground, as in this state they are considered preferable

both for horses and bullocks; and for the former it would be advisable to wash the roots if they be very dirty. And if the Carrots vegetate in the spring before the whole be consumed, this may be prevented by cutting off the crowns.

An account of the expense of culture and of the produce of a Carrot crop is given for each of the years 1806, 1807, 1808, and 1809. The average expense was about £ 10 13*s* per acre, ($ 46 78.) The produce from nine hundred to seven hundred and sixty bushels: and the average profit per acre is estimated at nearly *twenty-eight pounds*, ($ 124 44.) The experiments are all accurately detailed, and fully support the previous assertions of the writer.

FARTHER REMARKS ON THE CULTIVATION OF CARROTS, BY MR. KERSHAW, EXTRACTED FROM THE FOURTH VOLUME OF THE PUBLICATIONS OF THE BOARD OF AGRICULTURE.

He says, the country in general seem strangers to the utility of Carrots, in rich deep sandy soils in which they delight. If new land is broken up, it should be dry at least a foot deep, previously paring off the turf and burying it in the trench, after the loose earth is shovelled from the bottom—Lay it then in ridges, that it may be meliorated by the frosts, &c.—In March following, dig it a second time; not so deep as to bring up the turf; then sow your seed, first rubbing it between your hands with some dry earth, to prevent the grains from adhering together, which they are apt to do by forked hairs on their bodies. This should be done on a calm day, otherwise they might be blown into heaps; after which, tread the ground and rake it smooth. When the plants are come up, they should be hoed out at the distance of four or five inches, as it is not only necessary to set them singly, but this greatly promotes their growth. In about three weeks after, you may hoe them a second time; and if you wish them to be large, they should be left eight or nine inches distant every way, and continue to keep them clear from weeds. The thiner they stand, the larger they will grow. I remember once to have weighed three Carrots, which together were more than ten pounds. In November, when the weather is dry, take them up, cut off their tops, and pile them horizontally in a groove, to what thickness you like; cover them well with earth, upon which lay straw to prevent wet getting in. If

your situation is not dry, lay them on the surface and cover them as above directed, making a ditch round them to carry off the water—Carrots will stand most winters very well upon dry soils. If suffered to freeze they will rot, but not if the ground is dry. They are excellent food for horses and sheep, and only want to be in more general use to shew their intrinsic value. They are far superior to every other thing given to stock, (corn excepted.)

THE FIFTH VOLUME OF THE PUBLICATIONS OF THE BOARD OF AGRICULTURE, CONTAINS THE FOLLOWING COMMUNICATION, FROM A REV. MR. ELDRIGE.

Mr. Arthur Young has given a great deal of useful information concerning the mode of feeding cattle in the yard, with green fodder; but in treating of the Carrot, he has entirely overlooked the great value of this most useful root.

I hope you will not think me obtruding too much on your time, if I point out to you and the Board, its great good qualities for feeding. My ideas are not theoretical, as I have tried it for the last six years. In the year 1800, being in want of grass for a little Welch cow, as my land was all for hay, and having ten beds of Carrots in a new garden, I had the tops mowed off a little above the crown, so as not to injure by the scythe the head or crown of the roots; this, I need not inform you was a very luxuriant food for the cow; but I thought, and so did the servant who milked the cow, that she gave more milk when she had the Carrot top, than she had done before. The Carrot again yielded a fine luxuriant green head, which I treated in the same manner in October. I found when the Carrot itself was taken up, that it was equally as large and heavy, as a bed which I had reserved from cutting was. The gardener, who had been averse to cutting off the tops, was convinced it had not injured the root, but thought it had benefitted it rather than otherwise; as he had an opportunity of hoeing and clearing of them from weeds, better than he could when they had their tops on them—I am therefore convinced by experience, that the agriculturalist who grows a quantity of Carrots, loses a great quantity of most excellent green fodder for his cattle, by not mowing the tops of the Carrots off twice within the year. I trust you will, as the season for sowing is coming on, communicate this information in such a manner that this most valuable root may be better understood,

and of course more cultivated by the farmer than it has been; for I do not hesitate in stating, that a good crop of ten acres of Carrots, by being mowed, will keep ten cows, in good green fodder, the months of June, July, August, September and October; then the root itself will be found a very useful food during the winter months, for its sweetness causes a great flow of milk, and also it creates a sweetness in the milk, which the grass in general, commixed with the Dutch clover, has not. The farmer will also find that his horses and his pigs will eat it with avidity, and thrive well on it, as I can state from experience.

METHOD OF CHEESE MAKING.

[Selected.]

The milk is universally set for cheese as soon as it comes from the cow.

The management of the curd depends on the kind of cheese: thin cheese requires the least labour and attention.

Breaking the curd is done with the hand and dish. The finer the curd is broken the better, particularly in thick cheeses. The best colour of this kind of cheese is that of beeswax, which is produced by Annotta, rubbed into the milk after it is warmed. The dairy woman is to judge of the quantity by the colour of the milk, as it differs much in strength. The rennet is prepared, by taking some whey and salting till it will bear an egg; it is then suffered to stand over night, and in the morning it is skimmed and racked off clear; to this is added an equal quantity of water brine, strong as the whey, and into this mixture, some sweet briar, thyme, or some other sweet herbs, also a little black pepper and salt petre; the herbs are kept in the brine three or four days, after which it is decanted clear from them. Into six quarts of this liquor four large calves' bags, or more properly called calves' stomachs, are put. No part of the preparation is heated, and frequently the calves' bags are only steeped in cold salt and water. Turning the milk differs in different dairies, no two dairy women conduct exactly alike.

Setting the milk too hot inclines the cheese to heave, and cooling it with cold water produces a similar effect. The degree of heat is varied according to the weather. The curd when formed is broken with what is called a treple cheese knife. The use of this is to keep the fat in the cheese; it is drawn the depth of the curd two or three times across the tub, to give the whey an opportunity of running off clear; after a few minutes the knife is more freely used, and the curd is cut into small pieces like chequers, and is broken fine in the whey with the hand and a wooden dish. The curd being allowed about half an hour to settle, the whey is laded off with the dish, after it is pretty well separated from the curd.

It is almost an invariable practice to scald the curd. The mass is first broken very fine, and then the scalding whey is added to it, and stirred a few minutes; some make use of hot water in preference to whey, and it is in both cases heated according to the nature of the curd; if it is soft, the whey or water is used nearly boiling; but if hard, it is used only a little hotter than the hand. After the curd is thoroughly mixed with the hot stuff, it is suffered to stand a few minutes to settle, and is then separated as at the first operation. After the scalding liquor is separated, a vat, or what is often called a cheese hoop, is laid across the cheese ladder over the tub, and the curd is crumbled into it with the hands and pressed into the vat, to squeeze out the whey. The vat being filled as full and firmly as the hand alone can fill it, and rounded up in the middle, a cheese cloth is spread over it and the curd is turned out of the hoop into the cloth; the vat is then washed and the inverted mass of curd, with the cloth under it, is returned into the vat and put into the press; after standing two or three hours in the press, the vat is taken out and the cloth is taken off, washed, and put round the cheese, and it is replaced in the vat and in the press. In about seven or eight hours it is taken out of the press and salted, the cheese is placed on a board and a handful of salt is rubbed all over it, and the edges are pared off if necessary; another handful of salt is strewed on the upper side, and as much left as will stick to it; afterwards it is turned into the bare vat without a cloth, and an equal quantity of salt is added to it, and the cheese is returned into the press; here it continues one night, and the next morning it is turned in the vat, and continues till

the succeeding morning, and is taken out and placed on the dairy shelf; here they are turned every day or every other day, as the weather may be. If it is hot and dry, the windows and door are kept shut, but if wet or moist, the door and windows are kept open night and day.

Cleaning the Cheese. The cheeses having remained about ten days after leaving the press, are to be washed and scraped in the following manner; a large tub of cold sweet whey placed on the floor, the cheeses are immerged in it, where they continue one hour, or longer if necessary, to soften the rind. They are then taken out and scraped with a common case knife, with great care, so as not to injure the tender rind, till every part of the cheese is smooth; they are after the last operation rinced in the whey and wiped clean with a coarse cloth, and placed in an airy situation to dry, after which they are placed in the cheese room. The floor of the cheese room is generally prepared by rubbing it with Bean or Potatoe tops, or any succulent herb, till it appears of a black wet colour; on this floor the cheeses are placed, and are turned twice a week, their edges are wiped hard with a cloth once a week, and the floor is cleansed and rubbed with fresh herbs once a fortnight. They must not lie too long, or they will stick to the floor. This preparation of the floor gives the cheese a blue coat, which is always considered as of great consequence.

STILTON CHEESE.

[Selected.]

TAKE the night's cream and put it to the morning's new milk with the rennet; when the curd is come, it is not to be broken as is done in other cheeses, but is to be taken out of the whey as whole as possible with a large dish, and placed in a sieve to drain gradually, and as it drains keep pressing it gently till it becomes dry and firm; then place it in a wooden hoop, afterwards, to be kept dry on boards and turned frequently with cloth binders round it, which are to be tightened as occasion requires; these cloths are kept on, but often shifted for clean ones, till the

cheese acquires firmness enough to support itself; after which it must be rubbed twice every day with a brush for two or three months.

METHOD OF SALTING BUTTER.

BY J. ANDERSON.

[Selected.]

Take Sugar one part, Nitre one part, and clean strong Salt two parts, beat them well together and put by the preparation for use; of which take one ounce for every sixteen ounces of butter, and mix it thoroughly with the butter as soon as it is freed from the butter milk. Butter salted in this manner and put down in close tubs, with a little melted butter poured over the surface, to fill up every little vacuity, before the top is put on, will keep good for many years. Butter prepared as above is not fit to be used till after it has stood at least a fortnight, but may then be kept perfectly sound for many years.

INQUIRIES.

With a view to collect the most accurate information on the principal branches of Agriculture, as now practised, and thus be enabled to propagate the knowledge of whatever shall be found useful; and to open the way for future improvements, the following Inquiries were some time since addressed to gentlemen in various parts of the State, by the Trustees of the Massachusetts Society for Promoting Agriculture. The answers subjoined are from a highly respectable correspondent, Justin Ely, Esq. of West-Springfield.

Question 1. Of what quantity of land do the farms in your vicinity generally consist?

Answer. From twenty to eighty acres.

Q. 2. What is the quality of the soil?

A. As in all parts of intervale, a good rich loam near streams. The greatest part is a light sandy loam—some pine plain—a

little mountainous and rocky. Where the plaister of Paris has been applied to grass lands, the produce of grass is much increased; one bushel to the acre, sown late in the fall or early in the spring, will commonly double the crop: and when the same lands are ploughed up, after two or three years, the crops of grain are much increased thereby. By this course the lands are annually made more productive and valuable. Some people put on about seven loads of manure to the acre, and sow one bushel of plaister of Paris thereon, and the subsequent crops are thought to be as good as twenty loads of manure would produce without any plaister. Plaister is frequently sown in the spring, on Winter Wheat, Rice, Buck-Wheat, Hemp, Flax, &c. one bushel to the acre, with very good success.

Q. 3. Into what portions of pasture, mowing and tillage, orcharding and wood, are farms usually divided? Are the orchards improving or declining? Do they yield a competent supply of cider?

A. Pasturage, one sixth; mowing and tillage, one third; orcharding and wood, the remainder. Young orchards improving, old ones declining. More cider is made than is consumed in the town; considerable is distilled, the remainder sold or sent to market.

Q. 4. How much land on each farm is annually (on an average of years) planted or sown with grain of any kind?

A. One third is sown or planted.

Q. 5. In what manner is the land prepared, manured, and seeded with each kind of grain, and what is a medium crop?

A. For planting, the land is ploughed only once; for Indian Corn, a small part is dunged in the holes. Plaister of Paris is frequently put on after the first hoeing, (from a tea-spoonfull to a table-spoonfull to a hill; this is sometimes repeated after the last hoeing.) Crops, from fifteen to forty bushels an acre. Much Rye is sown on light land, ploughed and hoed in where Indian Corn is growing; the crop from five to fifteen bushels an acre. Wheat of the common kinds is raised on new lands lately cleared; the crop from twelve to twenty bushels. Early Virginia Wheat is considerably raised on old manured lands, and also where the sward of mowing and pasture lands have been turned over. It is commonly ploughed and harrowed twice

or thrice, without disturbing the sward which has been ploughed under; crop, from fifteen to thirty bushels.

Q. 6. In what manner is Indian Corn cultivated, and what is the medium crop on an acre?

A. Dr. Jared Elliot gives the following receipt to prepare seed Corn, to secure it against crows, blackbirds and vermin, viz. Take the roots of Swamp Hellebore, called Skunk's Cabbage, boil them in so much water as to keep them covered an inch deep; boil it two hours, then strain out the liquor, put in the seed Corn while the liquor is warm, steep it twenty hours, it is then fit to plant. Destroy all that is left; hogs, sheep and fowls, have been killed by eating it. Some Indian Corn is dunged in the holes at planting, but not generally. For the first hoeing, the land is harrowed by a horse, with a small harrow; for the second hoeing, the land is ploughed away from the rows, into the middle space, with a one horse corn plough; at the third hoeing, the ground is ploughed from the middle spaces to the rows. Crop, from fifteen to forty bushels. Some plant the rows from five to six feet apart, in squares, and plough both ways to the rows. Seed Corn should be gathered from the first which ripens, where two good ears grow on one stalk, that the crop may all ripen at the same time. Such seed Corn will generally produce two ears on a stalk. It should be gathered early, before the general gathering of the field.

Q. 7. What is the quantity and value of the Straw on an acre of Barley, Rye, Oats and Wheat, *respectively?* And to how much upland Hay are they *respectively* equivalent for fodder?

A. Barley, one and a half loads; Rye, one load; Oats, one load; Wheat, one and a half loads; very little is cut up for fodder; some is stacked up where cattle eat of it; some is used for litter for stables; but it is generally put into the yard as it is threshed. Barley, Oat and Wheat straw equivalent to one-sixth or one-eighth their quantity of upland Hay for fodder; Rye straw, from one-eighth to one-twelfth.

Q. 8. What is the value of straw of each kind, for any purpose, *other than fodder or litter?*

A. A little is used for making Cider and binding Hemp.

Q. 9. What is the value of the stover or stalks on an acre of Indian Corn, and to what quantity of upland Hay is it equivalent for fodder?

A. From one dollar an acre to one dollar fifty cents, equivalent to one-quarter or one-third the quantity of upland Hay, if well saved.

Q. 10. What quantity of land, on a medium farm, is annually planted with Potatoes?—How is the land prepared?—What quantity and kind of manure is applied to an acre, and in what manner?—How much seed is used, and how is it selected?—How are they cultivated, and what is a medium crop?

A. From one to three acres, generally the land is only ploughed. Sometimes coarse manure is ploughed in; eight to twelve loads straw or coarse manure to the acre are sometimes put in the holes at planting. Seed, twelve to sixteen bushels to the acre; the largest and best are selected for seed. Planted in squares; the rows three to three and an half feet apart, howed but twice, ploughed both ways to the rows—crop from hundred to two hundred and fifty bushels to the acre. A new kind of pale red, long Potatoes, with eyes all over them; some branches or prongs on some of them grow very long and large, produce from three hundred to five hundred bushels to an acre on land well manured. A new method is recommended: put on fifteen or twenty loads of coarse yard dung on an acre, plough it in; then plough furrows three to three and an half feet apart, put such manure in the bottom of the furrows, on which plant Potatoes nine or ten inches apart, cover them with similar manure; cover the whole by turning back the furrow. At hoeing plough the earth to the rows. When fit to gather, with a hog-plough lay open the rows by turning a furrow each way; gather what Potatoes are uncovered, then harrow down the furrows lengthways, then gather again produce from three hundred to five hundred bushels an acre. The culture of Potatoes is rapidly increasing; they are found more profitable to make stall-fed beef than Indian Corn; are better tallowed and fatten sooner.

Q. 11. How many bushels of Potatoes are equivalent, ordinarily, to one bushel of Indian Corn, for sale?

A. From three bushels to four.

Q. 12. How many days labour of a man are usually employed on an acre of Indian Corn, including the getting in all the Stover and stripping the husks from the ears?

A. From six to nine days.

Q. 13. What is the labour of shelling a hundred bushels of Indian Corn, and in what manner is it performed?

A. If threshed on a barn floor as usual, two days and an half, or three days. Some people tread it out with horses to save labour.

14. *Q.* How many days labour of a man are usually employed on an acre of Potatoes, including the getting in the crop?

A. From ten to twelve days, and sometimes more.

Q. 15. Is there any order or succession of crops known to be beneficial or pernicious to the soil?—If any, what is it?

A. Grain is beneficial when the stubble is soon ploughed in, also red Clover. Indian Corn, Oats, Flax, Turnips, Potatoes, and Hemp impoverish land.

Q. 16. What is the usual course of crops?

A. Grass ground is ploughed up in July or August after the second or third crop, on which early Virginia wheat is sowed in September, or the next spring Indian Corn, Flax, Potatoes, or Hemp. Rye is commonly sown among Indian Corn. After two or three crops of tillage, it is sown with English Grain, Oats, Barley or Flax, with red Clover and Herds Grass, if designed for mowing; if for feeding, with red Clover and English Spear Grass, and white Clover.

Q. 17. What is the medium quantity of Hay produced on an acre of upland, and what is the labour of mowing, curing and housing it?

A. From twenty to thirty hundred; labour from three to four days.

Q. 18. What is the medium product of Hay, on an acre of fresh meadow; and what is the labour of mowing, curing, and housing, or stacking it?

A. Thirty to forty hundred; labour four or five days.

Q. 19. What is the proportion of value which fresh meadow Hay bears to upland Hay, each being of a medium quality?

A. About two thirds.

Q. 20. Is any tillage land laid down with Grass Seeds, without sowing grain at the same time? If so, which method is found best?

A. Very seldom; to sow with Grain or Flax is thought best, as one crop is saved thereby.

Q. 21. What are the kinds of grass cut on the upland for Hay? What proportion is from seed sown by hand, and what are the kinds thus sown, and in what quantities *respectively* per acre?

A. Herds Grass, sometimes called Fox-Tail and red Clover. Sometimes white Clover or red top are mixed with them; the quantity, three or four quarts of red Clover-seed, with one quart or three pints of Fox-Tail, with a little of the other kind occasionally. Much red Clover-seed has been sown and left uncovered on the surface, or very slightly covered: if the following season is wet it may answer, but if dry it generally fails. The following method is now practised in this vicinity, viz:—The Clover-seed is continued in water, till it vegetates and the roots appear; it is then rolled in ground Plaister of Paris, and then mixed with the grain, and both are sown together soon after they are mixed, and immediately ploughed under furrow: many vegetate their grain also before it is sown. In Staunton's History of the Embassy to China, it is said the Chinese never commit this seed to the ground till it vegetates. I have known wheat so much grown as to adhere together, and be separated by hand before it could be sown, yet it came up uncommonly well and without any loss. The late Dr. Jared Elliott, of Killingsworth, in his Essays on Husbandry says, "Red Clover seed should be ploughed in furrows deep. It will grow from the depth of the furrow; is then more secure against being killed by draught or the winter; it will then produce larger stalks, more hay and seed, and more manure when ploughed in." On light loams or sandy land, it answers well. I have my doubts whether it will answer in clay soils or heavy loams; experience will determine. It answers well to plough with wheat or rye in the Fall, if the land is not very fertile; but on rich ground it will sometimes choak and ruin the crop, as I have repeatedly experienced. But if sowed and ploughed in with grain in the Spring, it will not endanger the crop.

Q. 22. Are any grass lands *new* seeded after scarifying them with the harrow only, or in any other mode, without ploughing? And what is the success of such practice?

A. None are done so. Sometimes stiff English swards are harrowed or dragged in the spring to loosen the sward with good success, but no seed sown thereon. But if scarified or dragged considerably, it would probably answer to sow Hay-seed.

Q. 23. What weeds, vermine or insects infest the mowing lands?

A. Docks which are pulled up by hand before the seed ripens, when the ground is soft after a shower of rain, also silk grass or milk weed. Saint John's wort sometimes diminishes the crops of grass. They may all probably be destroyed by cutting as mentioned in No. 25 and 47.

Q. 24. Are the spontaneous or cultivated grasses infested most?

A. The cultivated most, especially the red Clover by wood chucks and large black bobtailed mice.

Q. 25. What methods are used to destroy weeds, vermine or insects without ploughing the land, and what is their success?

A. Weeds, and alders, elders, briers, &c. as mentioned in No. 47. Milkweed or silk-grass is destroyed by cutting off the tops between the first and second mowing; when it is higher than the grass, it is cut off with a scythe without injuring the grass, with the third cutting at the second mowing it will bleed to death. The Saint John's wort, of which Judge Peters says, "He knows no plant in the pestiferous catalogue so exhausting and destructive," may probably be subdued by three cuttings, as mentioned in No. 47, and probably all other weeds, and bushes, and briers, &c.

Q. 26. What kinds of beasts, and in what numbers are they respectively, kept on medium farms? And how are they subsisted?

A. Horses, horn cattle and sheep are pastured in summer and kept on Hay, &c.; in winter their numbers are in proportion to the produce of the farm; hogs are pastured in summer, and fatted in the fall or winter on boiled potatoes, meal, and corn at a distance from the salt-water. Fine salt should always be kept in water-tight troughs in pastures where cattle, horses, hogs and sheep are kept, which should be staked down; all the stock will eat a little every day, and be in higher flesh; cows will give more milk, oxen and horses will do more labour, and better endure the heat. A large and respectable farmer informed me, that every hoof which went on his farm, was one third the better in consequence of his adopting that usage. It is very advantageous in fatting cattle.

Q. 27. In what place and in what manner are the cattle fed with the coarse winter fodder? Is it given in the stable, in the yard, or the field? Is it chopped or given whole?

A. As much of the stock is stabled and fed there as is convenient, the remainder are foddered in the yard; the fodder is not chopped, but given out whole. Sheds are made in barn yards, and the fodder is put into mangers for the cattle. Very little Hay is stacked out, and where it is, it is so near the barn yard as to be foddered out in the yard.

Q. 28. How much butter is usually made in a year from a cow, all the cream being churned? And how much skim-milk cheese is made from this same cow?

A. None are so managed here—I have known two good cows well kept on grass, make more than five hundred pounds of cheese in a season, besides furnishing a plenty of milk and butter for a small family of six or seven.

Q. 29. What food is given to sheep besides grass and hay?

A. Mostly potatoes—a little corn. But if corn or potatoes are given to ewes when their lambs are two or three weeks old, too freely, it makes their milk so thick, that their lambs can get none of it and die.

Q 30. What is the value of the subsistence of a sheep through the year, besides the pasturage?

A. From one dollar to one dollar fifty cents.

Q. 31. What is the value of pasturage for a sheep compared with the pasturage of a cow?

A. Six or seven sheep to one cow.

Q. 32. What is the ordinary weight and value of the flesh of a sheep when fit for the butcher? And what is the quantity of wool in a fleece?

A. From forty to sixty pounds weight the carcass, at five cents a pound. From two to three and an half pounds of wool.

Q. 33. What breed of swine are propagated? How are they fed? How fatted? At what age are they killed; and what do they then weigh?

A. The small boned, thorn backed, with small feet and ears, are esteemed the best to keep twelve months, and will then weigh from twelve to fourteen score, if well fatted. They are pastured in the summer and fattened in the fall or winter, on boiled potatoes mixed with meal, or Indian Corn or meal; some

few people use peas soaked or ground—soaking is preferred. Potatoes being washed are boiled in iron barrel kettles, made thin and set in furnaces ; two pails of water only are put in with a pint of salt ; the potatoes are heaped on the top, and a tub bottom upwards closely covers them. One armfull of dry wood will boil out all the water, and dry them like roasted potatoes—the steam will do all above the water. The hogs, horses and cattle like them best done this way, and they are said to yield much more nourishment. Done in this way, they are said to be as good for horses as oats of the same quantity—experience will determine it. The best pastures for hogs are of red Clover and white Clover.

Q. 34. What number of bee hives are kept ? What is their product in honey and wax ? What is the management, and what are the obstacles which discourage their extensive propagation ?

A. Very few are kept ; they do not generally prosper ; many die in the winter ; some are destroyed by mice.

Q. 35. What is the usual quantity of land sowed with Flax-seed ? How is it manured and cultivated ; and what is the medium produce of Flax and seed in quantity and value ?

A. From one quarter of an acre to an acre to a farm. The ground is prepared by repeated ploughings and harrowings, manured with ashes and chip manure, sometimes with other old and rotten manure. An acre commonly yields from two hundred to two hundred and fifty pounds, and five or six bushels of seed. Flax is worth from ten pence to a shilling a pound ; Flax-seed, from six to seven shillings a bushel.

Q. 36. How much labour is employed on a quarter of an acre of Flax, before it comes to the spinner, and including the preparing the seed for market ?

A. From seven to eight days labour.

Q. 37. In what articles consists the Surplus of the farmer, which is sold or exchanged for other articles ?

A. Horses, cattle, sheep and swine, grain of all kinds, beef, pork, mutton, hemp, flax, potatoes, cider and apples, &c.

Q. 38. How many loads of manure are collected (estimating thirty bushels to a load,) from the cattle in the barn yard, of a medium farm, in a year, specifying the number and kinds of cattle kept on the same farm, and the manner in which they are kept in relation to confinement or ranging abroad ?

A. Ten head of horned cattle, with three horses and ten sheep, kept up in the barn yard, and fed on straw, hay, &c. will make from thirty to forty-five loads.

Q. 39. What quantity of manure is made in the hog-pen? specifying the number of swine fatted, the kind and quantity of food consumed, and the weight of flesh produced?

A. Five hogs kept in a sty with litter, and fatted on boiled potatoes and meal, or corn, to weigh ten score each, will make from six to ten loads of manure.

Q. 40. What methods are used to enlarge the quantity, improve the quality or prevent waste of the manure, made in the barn-yard or hog-pen, and especially to save the stale of the cattle?

A. Weeds, leaves and grass turfs, are sometimes put into the barn-yard, and some weeds and straw are put into the hog-pen successfully, by a very few people, but it is generally neglected. No means are used to save the stale of cattle—it commonly mixes with the manure.

Q. 41. Is the manure and tillage labour exclusively applied to the best parts of each farm?

A. It is not. By good management and a proper course of crops, the poor lands are often made valuable and productive. Red Clover and the plaister of Paris will do it, when properly managed.

Q. 42. In what manner and for what purposes is manure used, except those indicated in the foregoing inquiries?

A. Plaister of Paris generally. Clay on light sandy soils, fifty or sixty loads to the acre, when pulverized, will make a valuable and productive loam, especially for red Clover. If the clay is near and easily dug, three men with a team and two carts will put on fifty or sixty loads in a day, *and the land will never forget it.* We have also large quantities of marl, but it is very seldom used; but probably might be very advantageously.

Q. 43. What other manures are used besides those created by the stock, and what are their merits compared with these?

A. Plaister of Paris considerably on nearly all kinds of soils; clay on light sandy land; fifty or sixty loads to the acre when dissolved and mixed will make a productive loam, especially for red Clover which should be ploughed in the whole crop the second year; when part of the seed is ripe, Rye should be sowed thereon. Some of the old plants of Clover will live, and a suf-

ficiency of the seed will grow to fill the land the next year; the first crop of Clover may be mown or fed; the second crop should be ploughed as above; one bushel of Plaister should be thrown on each year; the crop of Rye and Clover will pay all the expenses of the three years tillage; there will be no expense for Clover-seed after the first year.

Q. 44. Is lime-stone found in your vicinity? Is it used as a manure?

A. But little is found; the quality not good; none is used for manure.

Q. 45. Is Buck-wheat cultivated for the food it yields? Or is it used to cleanse the soil from weeds, to fertilize and enrich it, or for any other purpose?

A. Only for the food it yields; it is mostly ground for swine. Some think it an impoverishing crop; grass is said to succeed well after Buck-wheat, but no other crop. When Buck-wheat is sown very thick, one and an half bushels to the acre, and cut before it is killed by the frost and properly secured as Hay, the straw is said to make very good fodder. A respectable farmer, who kept a considerable stock, told me, he cut no hay that his stock was so fond of, as of such Buck-wheat straw. The usual quantity of seed is eight or ten quarts to the acre; by being sown thick the stalks will be small and better for fodder.

Q. 46. In what manner are new lands brought under cultivation? Is it customary to plant orchards in the new settlements?

A. The timber and wood are cut off; the land generally burnt over, then ploughed and dragged so as to pulverize it, then sowed with wheat, and after the first or second crop, laid down to grass; generally red Clover and Herd's grass. Orchards are rarely planted on new land.

Q. 47. How is land cleared, which bushes and under-brush have overrun, since the trees were carried off?

A. By cutting them down. The late Rev. Doctor Jared Elliott, of Killingsworth, in his Essay on Husbandry says, "The best time to cut bushes to kill them, are in the months of June, July, and August in the old of the moon, on the day when the sign is in the heart." He often tried it with success.

Q. 48. What is done with swamps, or swampy lands?

A. Drained if necessary and practicable, then cleared and subdued as mentioned in the preceding article, then laid down to

natural or imported grasses proper for the soil; sometimes ploughed up as soon as cleared, and Potatoes or Corn raised thereon for two or three crops till well subdued, then laid down to grass.

Q. 49. Is the growth of wood for timber and fuel equivalent to the consumption in your vicinity? If not, what measures are taken to provide against the inconvenience of future scarcity?

A. In those towns where cattle run at large on the commons, they eat and destroy most of the sprouts from the stumps of lately fallen trees, except they are inclosed. In West-Springfield and most of the neighbouring towns, by vote of the towns, all cattle, horses, sheep, and swine therein, are restrained from running at large. The owner of the beast must take care of his beast, and is answerable for all the damage done by his beast; and it may be impounded by any person, if going at large on the common. Under this salutary regulation, most of the trees which are cut down have sprouts from their stumps, which in a few years, say from twelve to twenty years, will yield as much wood as was taken from the stumps. As these settlements increase, there is much less destruction of wood while growing in forests by fires purposely or carelessly set. Rooms are generally made smaller and closer than in years past; fireplaces are made less, and stoves of different constructions are multiplied; the price of fuel is increased, and there is greater economy in the expenditure. Also, large fields of grain, clover, &c. are raised without any inclosure, whereby large quantities of wood which used to be expended in making fences are saved. The foregoing circumstances, with others, operates to save the consumption, and prevent the waste and destruction of fuel, so that, perhaps, the growth of timber and fuel is equal to the consumption thereof, in this and the neighbouring towns. If the regulation of restraining cattle from running at large had been adopted much sooner than it has, it would have been an incalculable benefit to the towns and community at large in all the old settlements.

Q. 50. Are wood lots generally fenced, or left open for cattle to range in without restraint? In getting your wood for fuel, do you pick the oldest trees, or do you cut clear? Which method is best calculated to increase the value of your wood lands?

A. No cattle are allowed to run—our wood lots therefore are generally not fenced. In cutting, some used to pick the best trees on common land, on their own land generally the old and decaying. Latterly, the practice of cutting all clear prevails—It will undoubtedly increase the value of our wood lands.

COMMUNICATION,

FROM THE AGRICULTURAL SOCIETY OF EAST-ANDOVER, COUNTY OF OXFORD.

Agreeably to your recommendation, the inhabitants of this town and its vicinity have formed themselves into a Society.

The people in this town as well as its vicinity, are almost entirely in the pursuit of agricultural concerns. But in our remote local situation, our very scanty pecuniary resources, and the new and uncultivated state of our little farms, with the want of books and other means of information, little, if any information, can be communicated to your Society. We, however, anticipate much advantage to ourselves by forming more correct habits of thinking and acting, as well as by the aids and communications you may be pleased to afford us, and trust we shall make a good use of all means of improvement.

As a Board of Trustees we have had but one meeting; little therefore can, at this time, be said in answer to your inquiries.* The following are respectfully submitted:—

Answer to question 1. Farms contain about one hundred and fifty acres of land, mostly unimproved.

2. The upland next to the intervale light and dry soil. The intervale good for all kinds of grass and grain, about seventeen acres. Back parts of lots hilly and rocky.

6. Little or no attention paid to Indian Corn.

10. To about one acre, ten or twelve loads manure. Crop two hundred bushels; seed about ten bushels.

11. From four to six bushels of Potatoes.

* The inquiries here alluded to are those stated in the preceding article, to the respective numbers of which those prefixed to these answers will be found to correspond.

18. We have no fresh meadow.

20. None.

21. Herds' Clover, red Top, and foul Meadow in intervale.

22. None.

23. Thistles the most destructive and hardest to kill; grasshoppers the worst vermine.

24. Cultivated.

26. Sheep and horned cattle and horses; about ten horned cattle and fifteen sheep—Fed on hay.

29. None.

30. Ninety cents, or one dollar.

31. About one tenth.

32. About fifty pounds; wool two and quarter pounds.

33. A mixed, ordinary breed, fed on Potatoes mostly; killed at about eight months old. Weight about two hundred pounds.

37. Beef, Pork, and Butter.

44. None found.

45. Just beginning to cultivate.

46. The trees generally felled in June, burnt to the next season, the timber cleared off fit for the harrow, when grain is sown without ploughing.

A species of the Apricot, as we suppose, has been found on Kennebec River; is cultivated in our gardens with little labour, and in the course of four or five years produces a plentiful crop of delicious fruit, about the bigness of a small peach. Some few of the stones we have sent you herewith for your inspection.

ON THE CULTURE OF THE YAM.

Mr. Ely of West-Springfield remarks, that in Willich's Domestic Encyclopædia, under the article *Yam*, is given a particular description of this vegetable. They are said to grow in America, and in the counties of Mid-Lothian and Sterling in Scotland, where they are raised and given to milch cows advantageously, and are cultivated on poor soils, which they meliorate, and prepare the land for a crop of wheat, produce twelve tons to the acre, and on some accounts are preferable to the Potatoe. If they will

flourish in Scotland, will they not, he asks, in New-England? Dr. Willich being a Scotchman, his information of the Yam growing there is probably correct. It is therefore surprising, says he, that they are not cultivated in New-England; and refers to Dr. Willich's description for a more particular account of the Yam.

THE FOLLOWING FROM THE DOMESTIC ENCYCLOPÆDIA IS THE ACCOUNT ALLUDED TO BY MR. ELY.

Yam, or *Dioscorea Bulbifera*, is a native of Ceylon, whence its culture has been introduced into the West-Indies, and other parts of America; it is divided into two varieties, known under the names of *red* and *white*; from the colour of their bulbous roots.

Yams flourish best on poor soils, and retain their beautiful verdure till a late period in the year; hence they are said to meliorate the ground nearly as much as a crop of Turnips. Being propagated by setting the eyes, their culture corresponds with that of Potatoes; and, like these roots, Yams often prove an excellent preparatory crop for Wheat. Farther, they are very productive; so that the red variety yields in general twelve tons per acre: the white sort is less fruitful; but being more delicate, it is chiefly raised for the table in the West-Indies.

The culture of these roots is at present, we understand, confined to the counties of Mid-Lothian and Sterling, where they are given to cows; the milk of which is thus considerably increased without affecting its quality or flavour.

As an article of food, the Yam possesses similar properties with the Potatoe, excepting that it is less mealy. In a raw state it is viscous, but when roasted, this bulbous root is equally wholesome and nourishing, so that the inhabitants of the West-Indies prefer it even to bread. In some respects, therefore, Yams are more valuable than Potatoes, because the former are much lighter and more easily digested:—when first dug out of the groûnd, then dried in the sun and preserved from humidity, in casks full of dry sand, they may be kept several years uninjured by frost, and without losing any part of their nutritive quality. These beneficial roots may also be pealed, deprived of their moisture by pressure, and dried in the same manner as Mr.

Millington directs Potatoes to be preserved. (See vol. 3. p. 438.) In this manner, Yams may be packed in casks, like flour, and imported in a perfectly sound state from the West-Indies. When grated and mixed with wheaten or barley flour, they may be formed into a light and salutary bread. Nor are they less nourishing when converted into pottage or pudding, with the addition of milk. Thus Mr. R. Pearson, (*Annals of Agriculture*, vol. 35.) informs us, that the meal obtained from the boiled and grated roots, when beaten up with milk and eggs, without any flour, yield a firm and well flavoured dish ; which could with difficulty be distinguished from a common batter pudding. By this treatment, the Yams are divested of their saccharine taste, which renders them at first disagreeable to some persons, though such property is on the whole of considerable use ; as it saves the expense of sugar.

SUN-FLOWER OIL.

[Extract.]

It appears from experiments made formerly in this State, that a bushel of Sun-flower seed yields a gallon of oil, and that an acre of ground planted with the seed at three feet apart, will yield between forty and fifty bushels of the seed. This oil is as mild as sweet oil, and is equally agreeable with sallads, and as a medicine. It may moreover be used with advantage in paints, varnishes and ointments. From its being manufactured in our own country, it may always be procured and used in a *fresh* state. The oil is pressed from the seed in the same manner that cold drawn linseed oil is obtained from flax-seed, and with as little trouble. Sweet olive oil sells for *six shillings* a quart. Should the oil of the Sun-flower sell for only two thirds of that price, the product of an acre of ground, supposing it to yield only forty bushels of the seed, will be £32, a sum far beyond the product of an acre of ground in any kind of grain. The seed is raised with very little trouble, and grows in land of moderate fertility. It may be gathered and shelled, fit for the extraction of the oil, by women and children.

VARIOUS USES OF THE

HELIANTHUS ANNUUS,

OR

COMMON SUN-FLOWER.

[Translated from a Portuguese work, entitled, Alographia dos Alkalis Fixos, published 1798, at Lisbon, by Jos. Mar. Da. Corse. Veillose.]

1. THE sprouts are eaten with oil and salt.

2. Bread is made from its seeds, as also gruel for children.

3. Some American nations eat the seed.

4. The seed gives oil for several uses.

5. It fattens fowls.

6. Its leaves are excellent food for cattle in summer, and increases the quantity of milk in cows; they are easily gathered, being of a large size, the inferior are to be first gathered.

7. They are also good for sheep.

8. Its stems can be used to support climbing plants instead of poles.

9. They serve for fuel. An economist of Frankfort found them as good as willow wood for this purpose. He planted two acres and a quarter, and by that he saved in a winter thirty dollars, and had oil worth twenty-eight dollars.

10. Lastly, they furnish excellent ashes. The seeds when roasted have the flavour of coffee, and the infusion of them in the manner of tea, is a pleasant beverage.

REVIEW.

Advice to Shepherds and Owners of Flocks, on the care and management of Sheep. Translated from the original French of M. Daubenton, by a gentleman of Boston. Boston, printed by Joshua Belcher, 1811. Sold by Bradford & Reed, Cornhill, Boston.

A complete Treatise on Merinos and other Sheep, with plates. Recently published at Paris, by order of the government, compiled by M. Tessier, Inspector of the Rambouillet Establishment and others in France. Translated from the French and dedicated to the Agricultural Societies of the United States. Printed at the Economical School-Office, New-York, 1811. Sold by Bradford & Reed, Cornhill, Boston. Price $1.

THE present high prices of Sheep are to be ascribed, principally, to two causes :—

First, The number of speculators in the market, who buy to sell again.

Secondly, The prevalence of the very erroneous practice of estimating future profits by the past and present, without sufficient regard to circumstances. A number of considerations are to be taken into view, in estimating the value of sheep as a stock for the farmer. These, while they tend to lower the extravagant anticipations of profit, which so many indulge, and to which the speculators allow no limits, cannot fail, on the whole, to encourage the skilful and attentive farmer, to expect ample remuneration from his flock in any circumstances of the country.

Without noticing the effect which a renewal of peace and intercourse with Great-Britain may have to depreciate our manufactures, and lower the prices of wool, we would barely state a few of the causes which, in the actual state of the country, may operate to disappoint some classes of our sheep-holders of their large profits.

And first—We think we have noticed among purchasers, in forming their flocks, too little solicitude to procure the finest wooled, and the finest formed sheep of the different grades, and, in some instances, too little knowledge of the comparative value of the different *grades.* For a few genuine merino sheep of the first quality, as a stock to breed from, almost any price we have ever heard of, will bear no comparison with the profits which may be calculated upon with certainty from them.

In England the difference in value of a sheep of the highly improved breeds, native of the country, and one of a common kind is strikingly great. An ewe, for example, of the *Dishley Farm Breed* sold at auction for *sixty-two* guineas; and *forty* ewes of the same breed, together, for *thirteen hundred and sixty* guineas, while at the same time the price of common sheep was from twenty to forty shillings only.

Of late, the prices paid for wool of every description have been very high. The *Merino* wool of different degrees of fineness, has all borne one price; the wool of the *half blood* and American sheep respectively, has been sold at but one price—the prices being regulated by the *grades*, without regard to the particular qualities of the article. This may have been owing partly to the inexperience of the manufacturers, but principally to the high prices of cloths which have induced the manufacturers to buy up with avidity all the wool at market, secure of an immense profit, whatever might be the qualities of the raw material.

But will this state of things continue? May we not calculate that the manufacturers will learn to discriminate more nicely in their selection of wool, as manufacturing establishments become more numerous, as the quantity of wool at market increases, and motives of interest and pride impel them to vie with each other in the fineness and beauty of their fabricks? Then, will not the flocks, derived from fine *stocks*, become, yearly, more and more valuable, and those from poor *stocks* continually depreciate?

Secondly, In the selection of American ewes for breeding it is observed, that the largest bodied sheep are usually preferred They require more food than those of a less size; and it has been abundantly proved in England, that small bodied sheep yield a greater quantity of wool, meat, and tallow, on an equal quantity of land than the large.

Thirdly, From the great resemblance which many sheep of the mixed bread bear to the *Merino*, impositions may easily be

practised on those who buy without taking the necessary pains to ascertain the purity of the blood. Repeated experiments, at the sheep establishments of government in France, have shewn, that the progeny of rams of the mixed breed degenerate after a few generations.

Fourthly, It is to be feared that sufficient attention will not be paid to foddering and protecting from the rigour of our winter, the numerous flocks, which have recently passed into new and inexperienced hands, or which, belonging to gentlemen living in the capital, are sent to distant parts of the country, to be kept at a stipulated price. Our apprehension is strengthened by the too great prevalence of an opinion that sheep are able at all seasons *to provide for themselves*, and require no kind of care.

To farmers, and all who are about forming flocks, and whose calculations of future advantage embrace a period of several years, the importance of procuring sheep of the best quality, as an original stock, cannot be too strongly urged. No farmer who keeps sheep and understands his own interest, will fail to purchase one full-blooded merino ram, at least; whatever may be the first cost, he will be amply remunerated in the character of his flock.

If ewes of a higher grade than the common American sheep are beyond his means, let him be careful to select healthy sheep of a broad frame, and rather middling size, with fine fleece. He will reap the benefit of this care in the quality of the first and all the succeeding generations. Hitherto, unfortunately, the finest sheep have been selected for the butcher, and the poorest only kept for breeding. Next to the selection of a proper stock, it will be important to provide abundant food, good pasturage in summer, and grain with pulse to be given with plenty of dry fodder, in winter. Some kind of shelter from the inclemency of the weather, in a climate like ours, is essential to the health and progressive improvement of flocks. With attention to these particulars, and some others, which are urged in the Treatises, the titles of which are prefixed to this article, proprietors cannot fail to derive a steady and constantly increasing profit from their flocks.

We cannot too strongly recommend the purchase of one or both these Treatises. They contain the results of long and careful experience, and cannot be too often consulted by those who would adopt the best means of meliorating their flocks.

That of *Daubenton* is in the form of question and answer, and though designed for the use of proprietors in Europe, who entrust the care of their flocks to shepherds, yet most of the qualities of a good shepherd, as therein described, should be possessed by those, who have the care of sheep in this country or in any other—The contents in general are of universal application.

If we were to make choice of one or other of these publications, it would be that of *Tessier*. It is later than *Daubenton*, and was written under the patronage of the French Government, and with a view, professedly, to impart knowledge, which had been obtained since the publication of *Daubenton*. We shall here give a few quotations from *Tessier*, which will enable the reader to form some opinion of the merit of the work.

"The merino race, known by the name of *Spanish sheep*, is the most esteemed, because it possesses properties, which render it superior to the others. Its size in Spain, when compared with other breeds, is neither the largest nor the smallest, but middling. In France all the dimensions increase according to the distance of time from the period of importation of these sheep, and in proportion to the care bestowed upon them, and the quantity of their food.

"The shape of the merino is rather round ; its face is broad and not upright ; its back is not arched ; its body is broad ; its legs are short ; some have dewlaps like that on the neck of a stag ; some have their cheeks, the lower part of their under jaw, and their forehead entirely covered with wool, which sometimes extends to the eyes ; some also have folds upon their shoulders, their buttocks and neck."

"The wool of the Merino is what principally distinguishes it ; this wool is very fine, abundant, soft to the touch, very greasy, thick, somewhat spiral, elastic, not so long as that of the common breeds, and of a dirty and brownish white, occasioned by the dust and filth which adheres to it. The whole body of the animal is covered with wool except the arm pits, the flat part of the thighs, and a part of the face. The young ones, especially those of the *second* year, have it to the extremity of their feet. The skin beneath the wool of such as are healthy is of a rose colour. It often happens that in sheep newly imported one may perceive among the filaments of the wool, particularly on the

cheeks, top knot, buttocks, and thighs, shining hairs of a bright grey, which are called *jarre*, or *dog's hair;* in France careful proprietors cause these hairs to disappear, by preventing the copulation of such males or females as have them. This hair must not be confounded with that sort of down which often appears on new dropped lambs, even of the finest breed; when they are two or three months old, this down disappears, and is succeeded by fine wool; those which had the most of it are commonly the best sheep.

"By means of the above characteristicks, it is easy to distinguish a merino from a common sheep; but there is no way of distinguishing it from a mongrel of the fourth or fifth generation; the exterior resemblance is so perfect, that a person who wishes to be assured of a creatures being full blooded, must not trust to inspection alone.

"The merino ewe may live twenty years, and even longer—such longevity is rare; many reach fifteen years, and continue to bear young all the time. The ram might with care be employed an equal number of years, but there is more advantage in making use of none but those which are young.

"It is known that in the animal kingdom the influence of the male upon the offspring is generally very great; it is particularly remarkable in the breed of merinos. Although in the union of the sexes the male and female both contribute to the formation of the fœtus, yet the first generations possess in a more striking manner the characteristicks of the male. If it be wished to continue a remarkably good breed, care must be taken to choose for copulation no rams, but such as possess the qualities it is wished to perpetuate.

"Care must be taken to castrate all the males of the mixed breed before they are able to get young, and to put the females to full blooded rams. I repeat it, that without this care the improvement of the breed will be retarded.

"It is often asked, how many sheep may be supported on an acre of ground?—the question is not easy to answer. It will depend, of course, on the quantity and quality of the grass.

"It is difficult to determine accurately the proper quantity of food which should be given to a sheep; it would be necessary, in order to form any certain rule, to know how much it eats in the open fields. *Daubenton* supposes the quantity so eaten to

be *eight* pounds of grass, which according to him are reduced to two when dried. Let us suppose a Farm at fifty or sixty leagues to the south of Paris: in such a situation, at the season when there is no more pasture, a merino ewe that is with lamb or nursing may well be nourished within doors upon two pounds of hay, together with one pound of a mixture of grain and fine bran, or two pounds of roots.

"The age of sheep, during the first five years of their life, may be ascertained by means of their front teeth or incisors. The first year eight incisors appear, which are afterwards shed. The animal is born with these teeth, or if any of them are wanting they soon make their appearance; they are narrow and sharp. The second year the two front teeth fall and are succeeded by two new ones, broader than the six which remain. The third year the two next to the front teeth also fall out, two broad ones grow in their room; so that then there are four broad teeth and four not shed. The fourth year the two next likewise disappear, to make room for two broad ones. Finally, the fifth year the two corner teeth fall. Some judgment of the age may also be formed from the corner teeth, according as they are more or less entire. When the animal is young, the teeth are short; they appear long at an advanced age, because the teeth continue to grow and the gums shrink. Merinos keep their teeth longer than other breeds, although they shed them sooner."

SOME OF THE MORE COMMON DISEASES OF SHEEP, AND THEIR REMEDIES.

"*The Scab.* Every part of a sheep's body is liable to be attacked by this disease, which may be radically cured if attended to. It is more obstinate on the lips and nose than any where else, because the animal rubs those parts while eating. The cheapest and simplest remedy is, an ointment composed of three parts of grease to one of oil of turpentine.

"*The Rot.* This disease has been supposed incurable, when once confirmed. *M. L'Abbé des Pierres* has however assured me, that by means of branches of *Broom*, with which he filled the racks of his sheep houses morning and evening, in wet weather, during the winter, he has stopped a confirmed rot; that the mortality ceased, and that the sheep grew fat as soon as they were put upon this regimen: this remedy merits the utmost

attention. Broom possesses great qualities; it is aperitive; its oil is good for the *itch* or *scab*, &c. The rot is caused by rich and wet pastures.

"*Apoplexy.* This destructive disease does not attack a flock without giving notice, by symptoms which an attentive keeper may perceive. The sheep appear less and less lively; they do not play about; their eyes are not so bright as usual; their wool looks dull, and they eat with a kind of indifference. A careful Shepherd, when he perceives these symptoms, immediately bleeds the whole flock."

ON THE DIFFERENT QUALITIES OF WOOL, FROM DAUBENTON.

Question. What are the principal distinctions in the wool?

Answer. The wool is white or of a bad colour; short or long; fine or coarse; soft or harsh; strong or weak; nervous or weak.

Q. What are bad colours in wool?

A. White wool only will receive lively colours in dying; the yellow, red, brown, blackish, or black, are used only in coarse manufactures; but such wool as is fine is used for stuffs which retain the natural colour, and is not sent to the dyer.

Q. What difference is there in point of coarseness, in the filaments of wool?

A. There are very fine filaments in all kinds of wool, even in the coarsest; but however coarse or fine wool may be, the coarsest part will be at the ends of the locks; by examining a great number of specimens, different sorts of wool have been distinguished, which may be reduced to the five following, viz: Superfine wool, fine wool, middling wool, coarse wool, supercoarse wool.

Q. How can these different sorts of wool be known?

A. It is necessary to have samples of the different kinds of wool, to compare with that whose quality it is designed to ascertain. To make this examination, a lock of wool is to be taken from the withers of the sheep, where the finest wool of the fleece is always to be found; then separate a little the filaments from one or another, at the end of the locks, in order to see them better, and place them on the side of the samples upon black stuff, to make them appear clearer, when it will easily be seen which samples they most resemble

Q. How is soft wool known from harsh?

A. It is sufficient to draw it between the fingers and lightly rub its filaments, to determine whether it is soft and mellow or harsh and dry.

Q. How is it known whether the wool be elastic?

A. Take a quantity of wool and squeeze it; if, on opening the hand it swells as much as it did before compressing it, it is elastic.

Q. What are the good or bad qualities of wool?

A. That wool which is white, fine, soft, strong, and elastic, is the best; that which has a bad colour and is coarse, harsh, and weak, is of an inferior quality; but that which is mixed with a great quantity of hair, (jarre) is the worst.

Q. What is this hair or jarre?

A. It is a fur or hair mixed with the wool, which is very different from it; it is stiff and shining; it has not the softness of wool, and does not take the dye when manufactured. Some of this *jarre* may be seen in superfine wool, and it is sometimes found as fine as the wool itself.

INTELLIGENCE.

Some opulent planters in Georgia are turning their attention to the cultivation of the Sugar Cane. From experiments already made, it is ascertained, that one acre of Cane will yield Sugar to the value of 2,400 dollars, deducting the expense of cultivation, which is about 400 dollars.

There was a great sale of Merino sheep at the Government establishment of Rambouillet, in France, June 16th 1813. Sixty-eight rams sold at an average price of 464 francs, 48 centimes, ($ 92 88.) None sold for less than 219 francs, 76 centimes, ($ 44.) The highest price given was 932 francs, ($ 187).

A new and valuable work on Chemical Agriculture, by the celebrated Sir Humphrey Davy, has lately appeared in Great-Britain. It is said to possess considerable merit, and promises to form an epoch in agriculture, both in Great-Britain and this country. It will probably soon be published here, and, if found to be as valuable as those who have seen it seem to believe, it will receive the patronage of the Massachusetts Agricultural Society, and, it is hoped, of all the friends to agricultural improvement.

NOTICE.

Official intelligence has been received by the Trustees, of the recent organization of Agricultural Societies in the several towns of Milton, Braintree, Quincy, Hingham, Dedham, Danvers, Holden, Shrewsbury, Ware, Lancaster, Southampton, Belchertown, Pelham, Vassalborough, and East Andover. Communications for the succeeding numbers of this publication from the above Societies, and from others which are or may be formed, as well as from individuals interested in the diffusion of agricultural knowledge, are earnestly solicited.

OFFICERS OF THE SOCIETY,

CHOSEN JUNE, 1813.

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Affectionate Son & obliged humble Servt
Gorham Parsons

PREMIUMS

OFFERED BY THE TRUSTEES OF THE MASSACHUSETTS SOCIETY FOR PROMOTING AGRICULTURE.

1. To the person who shall produce the largest quantity of wool, meat and tallow, from the smallest number of sheep, not less than ten, raised on his own farm, a premium of *thirty dollars ;* to be claimed on or before the first day of August, 1816.

2. To the person who shall invent a cheap method of raising water, for the purpose of irrigating land from rivers and ponds from ten to twenty feet above the level of the same, and give evidence thereof to the satisfaction of the Trustees, on or before May 1, 1815, *one hundred dollars*, or the Society's gold medal.

3. To the person who shall present to this Society the most complete (being nearly complete) Hortus Siccus, exhibiting distinct specimens of the greatest variety of grasses in general use, and specify, to the satisfaction of the Trustees, their respective qualities, productiveness, and usefulness as food for different kinds of animals, the gold medal, and *one hundred dallars ;* to be claimed on or before the 1st day of October, 1814.

4. To the person who shall produce from seed, the best growth of thrifty trees, not less than six hundred in the whole, and in the proportion of 2400 to the acre, of any of the following kinds of forest trees, viz. oak, ash, elm, sugar maple, beech, black or yellow birch, chesnut, walnut or hickory, *twenty-five dollars ;* if all of oak, *fifty dollars.* Claims to be made on or before the first of October, 1814.

5. To the person who shall ascertain by accurate analysis, the constituent parts of several fertile soils respectively, and in like manner the parts of several poor soils, and thus shall discover the defects of the latter ; and shall show by actual experiments, how the said defects may be remedied by the addition of earths or other ingredients which abound in the country, and in a manner that may be practised by common farmers, *fifty dollars.* And if it shall appear to the satisfaction of the Trustees, that, upon an extensive practice, the improvement of the

poor soil would be more than equivalent to the expense of the improvement, the addition of *one hundred dollars*. A minute description of the several soils, and all the circumstances attending the processes, cultivation, and results, will be required. Claims to be made on or before November 1, 1814.

6. For the best breed of swine; that which will afford the greatest weight of flesh on the smallest quantity of food, (satisfactory evidence being offered of a fair experiment,) a premium of *fifty dollars*.

7. To the person who shall raise the greatest quantity of hemp on an acre of ground, and improve at the same time not less than three acres for the raising of hemp, and provided the quantity shall not be less than six hundred weight to the acre —a premium of *fifty dollars*.

8. To the person who shall have raised within two years from the first day of June 1814 the greatest quantity of woad within this Commonwealth, not less however than 300 pounds, and shall produce to this Board specimens of the same, provided the quality thereof be good, a premium of *one hundred dollars*.

9. To the person who shall within three years from the first day of June 1814 produce a specimen of madder of good quality of his own growth, and who shall have actually raised the greatest quantity thereof, in this Commonwealth, being not less than 1000 pounds, a premium of *one hundred dollars*.

10. It is required that the communications, for which the foregoing premiums are offered, be accompanied with proper certificates from the selectmen, magistrates, or clergymen of the vicinity, or other vouchers, to the satisfaction of the Trustees; that they be delivered without names, or any intimation to whom they belong; and that they be severally marked in such manner as each claimant shall think fit; the claimant sending also a paper, sealed up, having on the outside a corresponding mark, and on the inside his name and address.

RICHARD SULLIVAN, *Recording Secretary*.

MASSACHUSETTS

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ON THE THEORY OF THE OPERATION OF GYPSUM OR PLASTER OF PARIS, IN PROMOTING THE GROWTH OF PLANTS.

BY JOHN GORHAM, M. D.

(Read before a Society in Boston July 16, 1813.)

FROM the period of the introduction of sulphate of lime, gypsum, or plaster of Paris, into agriculture, the mode in which it operates in fertilizing soils, or perhaps more correctly in facilitating the growth of vegetables, has been a subject of much speculation. The question is not yet decided, nor probably can it be determined, until, by long continued observation and repeated experiment, a more extensive series of facts shall have been collected and properly arranged. From what is already known, however, on this subject, various conclusions have been drawn and at present we must content ourselves with that theory which best accords with the acknowledged properties of gypsum, with the nature and qualities of soils and with the economy of the vegetable system. I propose briefly to examine the plausibility of the different modes of explanation which have been offered on the action of this compound, and afterwards to state the theory which appears to me most obviously to flow from a view of the few facts that experience and observation have established.

The opinion respecting the operation of plaster of Paris, the most generally adopted is that, which supposes it to depend

on its power of absorbing or imbibing moisture. It has been said that dew is found more plentifully on those parts of a field, over which the plaster in powder has been diffused, than on those which received no gypsum. If this be the case, it must be owing either to the gypsum being a better conductor of heat than the earth with which it lies in contact, or to its power of attracting water from the atmosphere. Were the plaster in large masses, its heat might be conducted off more rapidly than that of the surface of the ground; its temperature would thus be diminished, or it would become comparatively cool, and thus be rendered capable of condensing the aqueous vapour contained in the air continually passing over its surface. But the plaster is applied in the form of powder; in that state its conducting power must be diminished, and it is very probable that it can neither acquire nor lose its heat with greater rapidity than the soil with which it is mixed. The truth of the assertion above mentioned is very questionable; it is supported on doubtful authority, and it is not advanced with that confidence which accompanies the expression of a fact which is universally acknowledged. The idea of its strong attraction for moisture, appears to have arisen from the fact that gypsum produces the most obvious and the most beneficial effects on dry soils, from which it may be supposed that plants cannot always derive the quantity of water necessary to their growth and vigour. But even on the supposition that it does possess, even in a very considerable degree, the property of imbibing moisture, it can hardly be supposed that the extent of this power is such, as to supply a rich growth of vegetables with additional water, which shall be sufficient to produce a vegetation more luxuriant than in ordinary circumstances. The amount of the powder of gypsum distributed over an acre is from two to three bushels, the layer consequently is very thin; it soon becomes mixed with the rest of the soil; it then exists only in small proportions, and it is difficult to conceive that in this state, it can absorb much moisture from the air. Besides in some cases, for example, where it is intended to accelerate the growth of indian corn, it is often applied immediately to the seed, in the proportion of about a tea spoonful to each hill, and like the seed is covered with a layer of earth. In this situation it can-

not be supposed to attract moisture from the air, nor is it more evident how it can exert any influence in this respect on the neighbouring soil, for it is impossible to conceive that even those substances which are known to possess the most powerful attraction for water, could, in this proportion, afford any considerable part of this fluid which is taken up in such large quantities by every healthy plant. The sphere of this attraction must in these circumstances be very limited, and if the soil immediately in contact with the gypsum, were to yield its fluid to this compound, we have no reason to suppose that it would be immediately supplied from that more remote, and thus establish a current, if the expression be not too strong, toward the seeds and roots of the plant. As the corn which has been treated in this way generally (if not always) flourishes more vigorously than when left to the powers of the soil alone, we may infer that the gypsum continues to act, after it has acquired a considerable height. It therefore appears absurd to say that a spoonful of this compound should thus be able to furnish, or should thus become the means of supplying any considerable portion of the water necessary to the sustenance of a large plant for weeks, even granting its strong attraction for that fluid. I may now, however, observe, that from our knowledge of the composition and properties of gypsum, we may safely deny that in its ordinary state it possesses this property in any degree, more than other earthy bodies, whose particles are not strongly coherent. It never exhibits this property, unless it has been exposed to heat. Gypsum is a compound of lime, sulphuric acid, and water. When exposed to a high temperature in a solid state, it loses the water necessary to its constitution, and falls into powder. The remaining compound of lime and sulphuric acid has then a powerful attraction for this fluid, and when they are mixed with each other, care having been taken that the quantity of water added should not exceed that which has been evolved, the semi-fluid again becomes a solid ; a fact which is sufficiently familiar in the formation of *stucco*. When thus formed anew, the attraction for water ceases, for the gypsum remains dry and solid, while those salts or compounds which possess this property in the greatest degree, are the most deliquescent or the most disposed to become liquid on ex-

posure to the air, or moisture. Whence it appears that the natural compound of lime and sulphuric acid, at least that which is most common, and the only one employed in agriculture, is already saturated with water, that it is not deliquescent, and therefore that there is no probability, in reasoning from observation independent of direct experiment, that it has the smallest additional attraction for that fluid. It may perhaps be thought that the effects of gypsum on plants might be augmented by the use of the powder after its water had been dissipated by exposure to heat. But a moment's reflection will be sufficient to convince us that no additional advantage could be gained by this experiment. When deprived of its water, the attraction of the remainder for this fluid is so powerful that it would readily absorb as much as was required from the soil, but this water, instead of being transmitted to the roots of vegetables, would be arrested and combined with the other ingredients, and ordinary gypsum must of course be the result.

From what has been observed it may be justly suspected, if not actually believed, that the agency of gypsum in promoting the growth of plants, cannot with propriety, be ascribed to its power of absorbing or attracting moisture.

2. It has been thought by many that gypsum operates by accelerating putrefaction, or by promoting the decomposition of animal and vegetable matter.

It is much to be regretted that on purely practical subjects, and perhaps on none more than that of agriculture, we should content ourselves with loose and hypothetical opinions, unsupported by facts or experience. It would not be a difficult task for any gentleman farmer, with even a superficial knowledge of chemistry, to reduce a multitude of supposed truths to the test of experiment, and the result would probably be equally useful and honourable. If gypsum operate in the way I have just mentioned, it must be either, 1. by loosening the soil and thus allowing a freer access to the air, light, heat and moisture, or, 2. by increasing the temperature of the materials, or, 3. by affording something capable of exciting and continuing the fermentative process.

Some advantages may possibly be derived from gypsum by its mechanical effects of opening the soil or rendering it less

dense; but when we consider that it is added in comparatively small proportions and that in some cases it produces its specific actions, though applied immediately to the seeds or roots of the vegatable in even minute quantities, this effect at best can be regarded only as trivial. If the soil be composed principally of animal and vegetable matter, there is no doubt but that much greater benefit may result from ploughing, by which the mould would be more extensively exposed to the influence of the air, and would thus much sooner undergo those chemical changes, on which the subsequent fertility is in a great measure dependent.

There is no reason which should lead one to suppose that plaster can increase the temperature of a decomposing or decomposed vegetable mass; for as the heat generated in this process arises from fermentation and this again from chemical changes in the nature of the materials, the sulphate of lime must itself undergo some change or some decomposition to add to the fermentative matter and thus to augument its temperature. But, so far as we know, neither vegetable nor perhaps animal matter contains any thing which in the circumstances, in which they are placed, is capable of effecting this decomposition; for the attraction between the constituent principles of gypsum is exceedingly strong, and although potash, which is either contained in, or is formed during the combustion and perhaps the spontaneous dissolution of vegetables, is able to abstract the sulphuric acid from the lime, yet it is only when the alkali exists in excess, and its affinity for the acid is rendered more effectual by quantity, by heat, and by being long boiled with this calcareous compound. So far therefore we have no reason to believe that sulphate of lime can have any effect in increasing the heat of common soils, or of a mixture of animal and vegetable matters while undergoing the process of decomposition.

The last supposition, that gypsum may accelerate the putrefaction of the organized matter, with which it is mixed, by affording something capable of exciting or increasing the fermentative action, is still less probable. The species of fermentation, which takes place in this instance, is that to which chemists have given the name of putrefactive. It is the gradual re-

duction of organized substances into soil, in consequence of the operation of chemical laws, when not counteracted nor controuled by the principle of life. This action is spontaneous, and to be produced requires merely a moderate temperature, water, and contact with the air. There is no fact, with which I am acquainted, in favour of the supposition, that gypsum, as a compound, can facilitate this process, nor is there any thing in its composition analogous to animal or vegetable matter which can undergo this kind of decomposition. In the vinous and acetous fermentations, we know that these actions may be, and are, excited by the addition of yeast, or what some chemists have denominated ferment, a substance which, if not the same with, is at least very similar in its properties to vegetable gluten. The putrefactive fermentation may likewise be commenced by the mixture with a substance already in that state. But as sulphate of lime is incapable of fermentation, as it can furnish nothing which can produce it, and as, when mixed with the fermenting mass, it is found at the end of the process, unchanged in any of its properties, we may safely conclude that gypsum does not increase the fertility of soils by hastening the decomposition of organic bodies.

The only way we can conceive it to operate in this respect, is by depriving some of the vegetable productions of life, by which the ordinary affinities of chemistry may be brought into action, and thus the mass of decomposed matter or vegetable mould, and of course the quantity of nutriment, be indirectly increased. But there are no facts I believe to prove, that plaster when mixed with soils even in excess, possesses this positive power of destroying the life of plants, and this mode therefore of explaining the action of gypsum, is entitled to no greater weight than those which we have before examined. But it may be said that although neither of the circumstances above mentioned be sufficient, singly, to account for the acknowledged action of this compound, yet that it may be dependent upon and constituted by all of them ; and therefore may be ascribed partly to its opening the soil, partly to its facilitating the putrefactive process, and in part to its attracting moisture from the air. The weight of this argument must depend on the degree of merit that has been attached to each of the hypotheses;

It has been seen that with regard to the two last, we have allowed nothing in their favour, and have ascribed but little influence to the first; hence, if the arguments which have been advanced to disprove the correctness of these hypotheses, be allowed to be just, when considered separately, they must have nearly equal weight when united.

As the modes of action assigned to gypsum appear to be inadequate to the explanation of the facts hitherto observed, we must look farther, and on considering this subject, it seems to me to accord best with the supposition, that it operates on the roots of vegetables as a stimulant. To render this theory plain and intelligible, it will be necessary to premise that certain properties of life are common both to the animal and the vegetable system. They both possess the powers of absorbing, of circulating, of secreting, and of converting foreign matter into their own substance. All the phenomena of vegetation concur to prove that plants like animals enjoy a principle to which has been applied the name of irritability, and which is simply the susceptibility to contraction on the application of stimuli. It is probably the property which is the first developed and the last extinguished in all organized beings. Whether they also possess sensibility is a question which from our limited knowledge of the functions of vegetables, we are unable satisfactorily to answer. There are some facts which have induced a few vegetable physiologists to suppose that they do. If it be so, its phenomena are by no means so obvious as those resulting from irritability, and even this principle is not so apparent in the vegetable as in the animal system, for in the latter it is developed every moment, while in the former it requires some study to be perceived. This difference in the two systems is probably to be attributed to the greater rigidity of parts in vegetables which of course are less susceptible, and to an organization much more simple than that of animals, by which they may be deprived of that consent or connexion between various parts, which has been called sympathy. Whoever is acquainted with the physiology of plants, cannot avoid remarking that "the propulsion of the sap; the secretions whence new products are formed; the motions of their leaves; their susceptibility to the impressions of external agents, heat, light, air and moisture and electricity; their

growth, and the formation of the embrio plant with similar powers, are phenomena inexplicable on any principles of mechanism, and so strikingly analogous to those of the animal system, that they must be referred to the operation of a similar principle ;"* or a set of principles, one of which is irritability. The analogy between the properties of living animal and vegetable matter will appear even more intimate when we consider the circumstances by which their growth and vigour are accelerated or retarded and their condition is altered. In the former the proper balance of actions constituting health is preserved by the due regulation of food, of air, of exercise, and of temperature. If the food be moderately stimulant and nutritious, if the air be pure, the exercise equable, and the temperature uniform and mild, the operations of the system are free and unembarrassed. If the influence of external agents be excessive, or if the system be deprived for a time of its accustomed stimuli, disease and even death may follow. In the latter also the health of the plant is dependent on the degree of heat, and light applied, the quality of the air surrounding it, and the quantity of nutriment it derives from the soil. When excessive the plant is too highly stimulated ; when deficient it languishes, and debility and disease may be the consequence either of too strong or too feeble action. Exercise also is probably equally necessary to the vegetable as to the animal system. Whence it appears that there exists an intimate relation of properties between the two great classes of organized beings, and that probably their functions may be continued by the operation of the same principles, modified by structure and situation.

Like animals then, vegetables may be more stimulated than usual. The effect would be to increase the natural actions of the parts thus excited, and when they are not excessive, the result would be a vigorous vegetation, and a more rapid develpement of the organs. The metallic oxides, or compounds of metals and oxygen, the metallic salts, such as green vitriol, the native compounds of sulphur and iron, the neutral salts, such as nitre, &c. and the liquid oxy-muriatic acid, have been proved to promote the germination of seeds, and the growth of the plants.

* Murray's Chemistry, vol. iv.

These substances, it has been supposed, operate by the oxygen or the base they afford for the direct nourishment of the vegetable. But I am inclined to believe that they produce their effects as compounds and as stimulants, or if decomposed, that the use of the oxygen is rather to increase the action, than directly to augment the bulk of the plant; for although oxygen may be obtained from most vegetables, it has been for the most part previously combined with hydrogen in the form of water, which with more probability has been absorbed by the roots, than produced in the vessels of the plant. Why then may not gypsum operate in the same way? There is certainly no great incongruity in the supposition, and it is no argument against its acting on this principle, that it is perfectly inert as it regards the irritability of the human system. It has neither taste nor odour, nor any perceptible stimulant action on the organs of touch; but does it follow that it should therefore produce no effect on the seeds or roots of vegetables? Oxide of manganese and lytharge are inert to us, yet the experiments of physiologists appear to prove that they are not so to plants.

It may be supposed, that when the plaster of Paris is applied to the seed, it stimulates the little root, the action of the vessels is thus increased, absorption goes on more rapidly, and it acquires more nourishment in a given time than in ordinary circumstances, the consequences are a quick growth and enlargement of organs. If the stimulant effect be continued, the roots will become thicker than usual, they will spread to a greater distance from the centre, and perhaps penetrate deeper into the ground; hence in a given time, such a plant will absorb more fluids from the ground to be converted into sap, and to nourish the vegetable, than one which has not been thus stimulated; it will therefore be larger and more luxuriant.

It may be thought that if gypsum operate as a stimulant, it ought to produce the same effect in all cases, that is, it should act uniformly in all situations. But a slight view of the subject will be sufficient to convince us, that, as soils differ as much in nature as degrees of cohesion, some of them may contain ingredients which are in themselves highly stimulant, while others may, with regard to the vegetable fibre, be comparatively inert and bland. The application of plaster, to plants

vegetating in soils of the former character, would not be followed by any obvious advantage ; while in the latter it might promote in a very considerable degree, the growth of the vegetables, by exerting a more stimulant power than any of the substance with which they are surrounded. This idea may perhaps afford an explanation of the fact, or supposed fact, that gypsum produces no effect on plants growing in the vicinity of the sea. These soils are generally impregnated with common salt, muriate of magnesia, and even gypsum itself; for the water which passes through them, or which is obtained from wells in this neighbourhood, uniformly indicates, with proper re-agents, the presence of these salts. This water, no doubt, in many places rises near to the surface of the ground, and being constantly applied to the roots of vegetables, stimulates them so highly that no additional advantage can be derived from the use of plaster.

Note. Since the above was written, I have seen a paper in the Emporium of Arts and Sciences, for August and September 1813, upon nearly the same subject. In one part of it the editor refers to a paper on the operation of gypsum, published in 1793. Mr. Cooper supposes it to act partly as a stimulant, and in part as a promoter of putrefaction. I have never seen this publication, but it gives me pleasure to find that our ideas on this subject so nearly coincide.

THE BEST SORTS OF FRUITS.

As much greater encouragement has been of late given in the metropolis, to the raising of good fruit, as the inhabitants of our great towns begin to discriminate the several species, and to pay liberal prices for the best, it is hoped and expected that a greater attention will be paid by cultivators to the quality of the fruits they raise.

One of the greatest impediments to the improvement of our fruit, is the great inattention which has heretofore been paid to the names of fruit trees. It is not uncommon to have the same

apple or pear known by four or five different names. A farmer hears of a new apple which he is informed, and very correctly, is a most admirable fruit. It is called the "Pecker apple." He says, that it is entirely new to him, and not doubting his friend's description, which was indeed exact, he engrafts all his remaining stocks with it. After waiting five years for the result of his labours and anxious cares, he finds his new engrafted fruit one which had abounded on his estate before, of which he had as many as he could use or sell, and which he had known under the name of the "Baldwin apple."

It certainly is important to have fixed names. It would be better to have them the same by which the same fruits are known in Europe.

We shall, in order to facilitate the extension of this sort of knowledge among our farmers, subjoin a list of some of the best Peaches, Cherries, Apples, and Pears, by the names under which they are known in Europe, and in the Southern States.

PEACHES.

The AUNE PEACH, commonly called the Early Ann, is a very fine fruit, ripens late in August.

The WHITE MAGDALEN is a good peach, but fitter for a wall, or a very sheltered situation, than as a standard. It ripens in August.

The RED MAGDALEN is an excellent peach, and ripens in September.

The NOBLESSE is a large, fine peach, ripens early in September.

The OLD NEWINGTON is a cling-stone, and is very high flavoured. It ripens late in September.

The SWALCH is a fine peach ; ripens early in September.

The CATHERINE, sometimes called the GREEN CATHERINE, is a very fine peach ; ripens in September.

The LEMON CLINGSTONE is a large, late, but beautiful and high flavoured peach. It ripens the last of September, and beginning of October.

The VANGUARD is also a good peach ; ripens about the middle of September.

The BLOOD PEACH might sell for preserving. It makes a beautiful preserve. It is hardy and a great bearer.

All these Peaches may be obtained of any nursery-men in New York, or at Flushing, Long-Island, of Wm. and B. Prince, and buds may be had of most of the gentlemen in this neighbourhood.

CHERRIES.

There are but few kinds of this fruit, which merit general cultivation. The curious horticulturalist may collect fifteen or twenty sorts, but four or five kinds would be sufficient for general cultivation.

It is to be regretted that so little attention is paid by the farmer to cultivating those fruits which are considered as mere luxuries. We do not say that the cherry ought to enter into competion with the apple, but since the cherry tree would form a beautiful shade round his buildings, and would afford a pleasant, (and if left to ripen perfectly) a very salutary article of food, it is to be regretted that it is so seldom introduced.

Almost every man has a small garden spot; if he will not go to the expense of getting the stocks, he may always procure the cherry stones. They are of quick growth, and a very hardy tree.

It is easily improved by grafting and inoculation, and even the natural fruit is often very fine.

The species most valuable to a farmer would be,

The MAY DUKE, a red cherry, commonly called Kinsely.

The ENGLISH CHERRY. This is the most common in our country.

The BLACK HEART is the most common of the finer sorts, and is the most valuable, because a very free and full bearer. It is commonly eaten too early, because persons suppose it ripe as soon as it is red and pleasant. It should be left till it is quite black.

The WHITE HEART. This is a general name applied to two or three species. They are distinguished by some as the *Lukeward* and the *Bigarow*. The latter is the French name, and the several cherries under that name, are better described by French writers.

It is a large, beautiful fruit, less inclined to bear freely, and more liable to destruction by moisture.

The BLACK TARTARIAN CHERRY is a noble fruit, and a very good bearer.

Scions of all these sorts may be easily procured by applying to any of the Trustees of the Massachusetts Agricultural Society. Besides the above there are several varieties of the the *Mazard*, or natural cherry, which are very excellent fruits, and valuable for being later than the others. They are generally hardier trees, and will bear neglect better than the finer sorts.

APPLES.

This fruit being too generally sonsidered only as affording a beverage, our farmers are apt to be indifferent to the species which they raise. The natural fruits, it is true, often make the best cider, but it is not uncommon to see a farmer who may make twenty or fifty barrels of cider, unable to pick out a single barrel of fine apples which he can preserve to a time when he wants them most, the spring of the year, when they are as salutary as they are agreeable. The scions of Apples may be procured and sent to any distance in March, and till the tenth of April, and if well taken care of, by being plunged in clay or moist earth, they may be inserted from the twentieth of March to the tenth of June. Any farmer might soon learn the art of engrafting, and their old orchards will furnish stocks. Trees are often preserved and renewed by heading them down and grafting them, if this is done judiciously.

The sorts which we should recommend for general cultivation are,

The RHODE ISLAND GREENING, a good *fall* and *early winter* apple.

The NONSUCH, a red apple, excellent, and very late keeping apple.

The NONPAREIL, a Russet apple, early in winter.

The NEWTOWN PIPPIN, a good, hard, late keeping fruit.

The SPITZENBERG. This is a fine fruit, and will keep sound till May or June.

The ROXBURY RUSSETING. This is one of the best known

and most valuable fruits. It is not fit to eat till February, and is very easily preserved till June.

The BALDWIN APPLE, (recently brought into notice, though it has been in the country probably for many years,) is a very valuable fruit, beautiful, fine flavoured, and will keep till the last of March.

There are at least fifty sorts of good apples, besides those above specified; we have only noticed those, which would be the most extensively useful as winter fruits. We have selected those which will always command a price in market.

PEARS.

This is a fruit remarkably well adapted to the climate of Massachusetts. It is much to be doubted whether any country in the world produces finer pears than have been raised in this state.

But the cultivation of them has been in a great degree confined to the vicinity of the metropolis. We probably have in this state nearly every good variety of pear known in France. We mention France, because in that country, more successful attention has been paid to this fruit, than in any country in the world. To the Hugonots who fled from France on the revocation of the edict of Nantz, we owe almost all the fine pears we have. They are to be traced to the gardens planted and owned by them. Although there are near an hundred species or varieties of pear cultivated in France, yet there are not more than ten or twelve which we should recommend to general cultivation.

We would observe, however, that the farmers who live near great towns, may very usefully and profitably extend the culture of pears beyond those who live at a greater distance.

In the remoter parts of the state it might however be thought worth while to plant a tree, the hardiest and most long lived of any fruit tree, with which we are acquainted, even if it only served to add an innocent luxury to the table of the farmer.

Those who live within thirty miles of a market-town might bring all their winter, and many of their summer pears to market.

Here we would remark, that the habitual negligence with

which every species of fruit is brought to market, is extremely to be lamented. It is almost fatal to the sale. It diminishes both the demand and the price. There are two great faults on this head. The one is, that the fruit is gathered unripe, under the pretence that if ripe it would not bear transportation. The other is, that it is thrown negligently into great masses, without the least trouble or arrangement, and then hurried over bad roads to town, where it is left exposed to the sun and flies, which soon destroy not only its appearance but its flavour and value.

Is this owing to a want of encouragement in our country? No. There are no people in the world more extravagant in the purchase of their luxuries than the Americans. Let one man set the example of bringing his fruit in better order, and he will receive a hundred per cent more, beyond the extra expense. Is there any thing in our country, which renders it impossible or unprofitable to our farmers to carry their produce to market neatly and in good order? We know of nothing. But we do know that fruits of the tenderest sorts are transported in England and France great distances, and exhibited for sale in the most perfect condition. Every fruit has its own peculiar mode of packing and conveyance. The strawberry and the cherry are carried in baskets of a conical form, so that there is no pressure, which would ruin these delicate fruits. We do hope to see our farmers not so sparing of a little straw or hay, and good baskets, and a little labour of packing, instead of turning peaches, and pears, and apples into a cart in one mass, a certain loss to themselves, and as great an injury to the purchasers.

The sorts of pears for common use, which may be recommended, are

The LITTLE MUSCAT, a small summer pear, ripe in August.

The several varieties of CATHERINE PEAR. They have all of them a general resemblance—summer pears.

The JARGONELLE, a fine summer pear, and a general bearer.

The SUMMER BERGAMOT, a green fine pear of an apple shape; ripens in September.

The BROCKHOLST BERGAMOT, a delicious pear, ripe early in October.

The BROWN BEURRE; the best pear which is known but short lived, ripens in October.

The ST. MICHAELS. It has a great variety of names, but is most commonly known under the above. It is a great bearer, hardy, will grow in any soil, is in eating from October to Christmas if taken good care of, and is among the most valuable pears which grow.

The MONS. ICAN is another valuable pear. It is ripe about the first of November, and will last till the middle of December.

The ROUSSELINE is also a fine fall pear, and will sell well.

The WINTER GOOD CHRISTIAN is a pear, which keeps well and may be transported a great distance, being very hard when gathered.

The VIRGOULOUSE and COLMAR resemble each other, and are very fine. They are December pears, and will sell well at market.

The CHAUMONTELLE is also a fine, late fall pear, and a great bearer.

But the pear which may be cultivated to the greatest profit; the most uniformly good, the best of the excellent pears for keeping, is the ST. GERMAIN. It is a hardy tree, and will endure a century. The pears barrelled up might be transported a hundred miles in December or January, and will always command a good price. Perhaps, however, they could not profitably be transported more than forty miles.

This very imperfect list of fruits has not been made out with a view so much to increase the profits of the farmer, as to shew to him that with a little pains, less than he often bestows in procuring a thing injurious to him, he might always regale his family and friends with what the richest and greatest men consider the most acceptable thing they can offer to their guests, most excellent fruits.

ON THE CUTTING OF CARROT TOPS.

The following communication was made to the Trustees by the Hon. Justin Ely, Esq. of West Springfield. It will be observed that it is not an experiment made by himself, of course he cannot be responsible for its accuracy. In introducing it we think it our duty to remark, that we very much doubt whether on repeating the experiment, the same result will be found to follow. It is certainly very much against the prevailing notions of the physiology and growth of plants to admit that the roots of any plant will grow and increase in size as fast without its top as with it. Certain it is, as to most plants, in an early stage, if you deprive them of their leaves, the root will instantly be checked in its growth, and often die. One of the Trustees of this Society, having often heard the same proposition asserted as to potatoes, was induced the last year to make the experiment. Two rows of potatoes were planted in his garden with this view, and they were equally well situated and manured; of the one of which he cut the tops, the tubers or potatoes were not above half so large as those of the other, which remained untouched. We do not say these things to discourage the experiment; we should be pleased to have it tried again by many persons. It certainly would be a desideratum, especially in dry summers, when the pastures are much parched, to be able to cut a fine green fodder for cows, without injury to the future crop, and its importance will justify a repetition of the experiment.

MR. ELY'S COMMUNICATION.

"On the culture of carrots it has been doubted whether their tops can be cut off as fodder for milch cows, without materially impairing the amount or value of the crop; on which I have the following information from a very credible person who lived some years in a family, about sixty miles from Boston, where two or three hundred bushels of carrots were yearly raised; part of which were topped twice in the season for cows. The

roots of those that were topped, grew larger and better than those that were not topped. Part of the crop was gathered in the fall, and fed out to hogs, cows, and horses, and part were left in the ground till the spring, when they were gathered and the crowns cut off to prevent their sprouting. In the spring some were washed, cut small, and mixed with meal or bran for young calves, intended to be raised. They were soon so fond of them as to eat them whole without washing. They were found to be very beneficial for them and to answer better than any other food."

ON THE ADVANTAGES OF EMPLOYING VEGETABLE MATTER AS MANURE IN A FRESH STATE.

[Vol. i. Trans. London Horticultural Society. Communicated by the President, Mr. T. A. Knight, Jan. 6th, 1812.]

Writers on agriculture, both in ancient and modern times, have dwelt much upon the advantages of collecting large quantities of vegetable matter to form manures; whilst scarcely any thing has been written upon the state of decomposition, in which decaying vegetable substances can be employed most advantageously, to afford food to living plants. Both the farmer and gardener, till lately, thought that such manures ought not to be deposited in the soil till putrefaction had nearly destroyed all organic texture; and this opinion is, perhaps, still entertained by a majority of gardeners; it is, however, wholly unfounded. Carnivorous animals, it is well known, receive most nutriment from the flesh of other animals, when they obtain it most nearly in the state in which it exists, as part of a living body; and the experiments I shall proceed to state, afford evidence of considerable weight, that many vegetable substances are best calculated to reassume an organic living state, when they are least changed and decomposed by putrefaction.

I had been engaged, in the year 1810, in some experiments, from which I hoped to obtain new varieties of the *plum*; but one only of the blossoms upon which I had operated, escaped

the excessive severity of the frost in the spring. The seed which this afforded, having been preserved in mould during the winter, was in March placed in a small garden spot, which was nearly filled with the living leaves and roots of grasses, mixed with a small quantity of earth; and this was sufficiently covered with a layer of mould, which contained the roots only of grasses, to prevent in a great measure the growth of the plants which were buried. The pot, which contained about one sixteenth of a square foot of mould and living vegetable matter, was placed under glass, but without artificial heat, and the plant appeared above the soil in the end of April. It was three times during the summer, removed into a larger pot, and each time supplied with the same matter to feed upon; and in the end of October its roots occupied about the space of one third of a square foot, its height above the surface of the mould being then nine feet and seven inches.

In the beginning of June a small piece of ground was planted with *potatoes* of an early variety, and in some rows green *fern*, and in others *nettles* were employed instead of other manure; and, subsequently, as the early *potatoes* were taken up for use, their tops were buried in rows in the same manner, and potatoes of the preceding year were placed upon them and covered in the usual way. The days being then long, the ground warm, and the decomposing green leaves and stems affording abundant moisture, the plants acquired their full growth in an unusually short time, and afforded an abundant produce; and the remaining part of the summer proved more than sufficient to mature potatoes of an early variety. The market gardener may probably employ the tops of his early *potatoes*, and other green vegetable substances in this way, with much advantage.

In the preceding experiments the *plum stone* was placed to vegetate in the turf of the alluvial soil of a meadow, and the *potatoes* grew in ground which, though not rich, was not poor; and therefore some objections may be made to the conclusions I am disposed to draw in favour of recent vegetable substances as manures.

The following experiment is, I think, decisive.

I received, from a neighbouring farmer, a field naturally barren, and so much exhausted by ill management, that the

two preceding crops had not returned a quantity of corn equal to that which had been sowed upon it. An adjoining plantation afforded me a large quantity of *fern*, which I proposed to employ as manure for a crop of turnips. This was cut between the tenth and twentieth of June; but as the small cotyledons of the *turnip-seed* afford little to feed the young plant; and as the soil, owing to its extreme poverty, could not afford much nutriment, I thought it necessary to place the *fern* a few days in a heap, to ferment sufficiently to destroy life in it, and to produce an exudation of its juices; and it was then committed in rows to the soil, and the *turnip-seed* deposited with a drilling machine over it.

Some adjoining rows were manured with the black vegetable mould obtained from the site of an old wood pile, mixed with the slender branches of trees in every stage of decomposition, the quantity placed in each row appearing to me to exceed more than four times the amount of the vegetable mould, which the green *fern*, if equally decomposed, would have yielded. The crop succeeded in both cases; but the plants upon the green fern grew with greatly more rapidity than the others, and even than those which had been manured with the produce of my fold and stable yard, and were distinguishable, in the autumn, from the plants in every other part of the field, by the deeper shade of their foliage.

I had made in preceding years many similar experiments with small trees (particularly those of the mulberry when bearing fruit in pots) with similar results: but I think it unnecessary to trespass on the time of the Society by stating these experiments, conceiving those I have stated to be sufficient to shew that any given quantity of vegetable matter can generally be employed, in its recent and organized state, with much more advantage than when it has been decomposed, and no inconsiderable part of its component parts has been dissipated and lost, during the progress of the putrefactive fermentation.

ON THE CULTURE OF FLAX.

The following short letter from Mr. Charles Hallet on the culture of flax is inserted principally because it tends to corrob-

orate the ingenious suggestions of the celebrated naturalist and cultivator, Mr. Knight, (published in this Number,) relative to the use of manures in an undecomposed and crude state; an idea which has also been much enlarged upon by a Virginia gentleman, who has published a pamphlet with the signature of *Arator*.

We mean to take no side in this new and most interesting question. We give the public the facts, let them judge or try experiments, as they please. We can only say, that there is ingenuity in the theory, and considerable evidence in the experiments. It is rather singular that, at the same moment, without any concert, an English naturalist of great eminence, and an American cultivator of distinction, should have come out in support of a theory entirely new, and that is, that manures instead of being reduced to a state of decomposition, should be used in as fresh a state as possible, and that all the time, labour, and expense bestowed in stercoraries, in accelerating fermentation, are not only lost, but a great deal *worse than lost*.

Mr. Hallet's short letter does seem to give colour and support to this theory, (if he has in fact been more successful than his neighbours,) and we should be more disposed to attribute this success to his ploughing in his stubble, than to his shallow ploughing, of the utility of which we must have some doubts. We invite experiments and remarks on this novel and ingenious theory of the best *state of applying* manures.

MR. HALLET'S COMMUNICATION.

Yarmouth, *(Cape Cod,) Jan*. 24, 1814.

Attending some years past to agriculture, and particularly to the raising of flax, which I have attempted with good success, I will state my method, as differing from that of my neighbours, particularly in one respect—other people generally dig up, and take off their corn stalks—instead of so doing, I gather my corn, and in the last of February following, I take a frosty morning, and cut with a steel hoe every stalk even with the ground. I think they keep the ground light, and are a very good manure for flax, as they will nearly all be covered up in ploughing, which I always do twice; first turning the sward

up, and then ploughing quite shoal the other way, across the first ploughing.

I have also improved my land very much by ploughing shoal, turning up neither clay nor sand, if it were but one inch deep; but then it requires double the hoeing.

CHARLES HALLET.

MODE OF RAISING FLAX, PRACTISED IN WATERBURY, VERMONT.

[Letter from Mr. C. Morse to I. P. Davis, Esq.]

DEAR SIR, *Waterbury, (Ver.) April* 4, 1814.

Agreeably to your request I send you some account of my mode of cultivating the *flax plant.* But as the soil and climate of this country varies so much in the different states, I shall not perhaps be able to give you any information that will be of service; since it almost wholly depends upon time, place, and circumstances, and how and in what manner you proceed. You will however find a pretty full and elaborate account in the Encyclopædia, and two interesting papers on the subject in the Memoirs of the Philadelphia Society for promoting agriculture, vol. i. published in Philadelphia in 1808. But after all you will have to depend on practical information, without which the theory will be of little use.

First, then, much depends on the choice of your ground; but this the *practical flax farmer* will be better able to judge of for himself than to confine himself to any given rules. The ground thus chosen must be more highly prepared by ploughing, harrowing, &c. than is commonly done. The quantity of seed necessary, is about three and a quarter, or three and a half bushels per acre, and requires to be sown very even and true; it is then harrowed in the common way, always finishing with the brush harrow. A slight sprinkling of ashes when it is coming out of the ground is now of great use, as it prevents the worms from eating the roots. When the flax is about four inches high, it is necessary to give it a pretty thorough weeding, as if well attended to at that time, the weeds will not again grow so as to injure the crop. The time for *pulling* is in the third set of blossoms, and when the centre

bowl has nearly attained its full size. It now requires to be pulled, bound up in bundles of a moderate size, and carried into the water, which must be a pool of about three or four feet deep, standing, but not stagnant water, and may be naturally or artificially formed.

The most difficult part of the whole process, and that which requires the most experience, is now commenced; as a single false step will easily destroy the whole crop.

The length of time it remains in the water depends on the warmth of the season, and the quality of the water, as it is necessary to check the fermentation at a particular height. When the fermentation is sufficiently high, it must be taken out, and spread on ground newly mown, or that is closely fed; that which is least likely to grow fast is to be preferred. It requires to be spread very thin and even, and carefully attended, till it is sufficiently bleached, when it is ready to be taken up, and is fit for dressing.

The length of time taken up in bleaching depends upon circumstances, and can be determined only by the judgment of the person who attends it at the time.

The dressing is the same as the common mode, and is generally well understood throughout the country.

Should you think the foregoing remarks of any use, you are at liberty to present them to the society, together with my best wishes for the success of an institution so highly beneficial to the community.

I am, &c. CYRUS MORSE.

Note. The flax raised at Waterbury, and in the towns of Stratford and Milford, is of a remarkably good quality. It is worth from twenty-five to thirty dollars per cwt. The common flax of the country is worth only about seventeen dollars per cwt.

CULTIVATION OF HEMP ON CONNECTICUT RIVER.

[Letter from the Hon. Justin Ely.]

Considerable quantities of hemp have been raised in the towns laying on Connecticut river, for ten or fifteen years past.

It is water rotted, and when properly managed is as good as the best imported hemp, and some think it stronger and better, being never fermented and weakened in the hold of the ship, as all foreign hemp is said to be. The northern part of the United States may undoubtedly raise as much hemp as is wanted in it, and probably more, if the inhabitants can be persuaded to cultivate it, and there is no greater difficulty in it than in raising flax when equally accustomed to it.

Preparation. Hemp will grow on any soil, if made sufficiently rich with manure, and ploughed and harrowed three times at the least. Tough soils will require harrowing four or five times to pulverize and lighten the soil sufficiently. Fifteen or twenty cart loads of good hog manure, or stable, or other rotten manure, should be put on an acre for the first crop. Half or two thirds the quantity of manure will answer annually for the subsequent crops for any number of years. The manure should be ploughed in at the first ploughing, which should be deeper than the subsequent ones.

Some very rich soils, and low grounds near streams and bog meadows, and other meadows, when properly prepared, will raise one or two crops of hemp without manure. Around most barn yards, where the ground is rich, a quarter or half an acre of hemp may be raised with advantage. It is indispensable that the land be rich and mellow, to raise good crops of hemp. The land should be ploughed in April, as soon as sufficiently dry and warm. Turf land should be turned over in August or September preceding.

Seed. It should be sown early to secure a good heavy *harl* or coat on the stalk. From the eighth to the fifteenth of May is thought to succeed best on our warm lands on Connecticut river. The ground ought to be warm before it is sown, perhaps in colder soils it will answer as well a few days later.

The seed should be of the last year's growth, and well dried as soon as threshed, to prevent its heating, which spoils it.

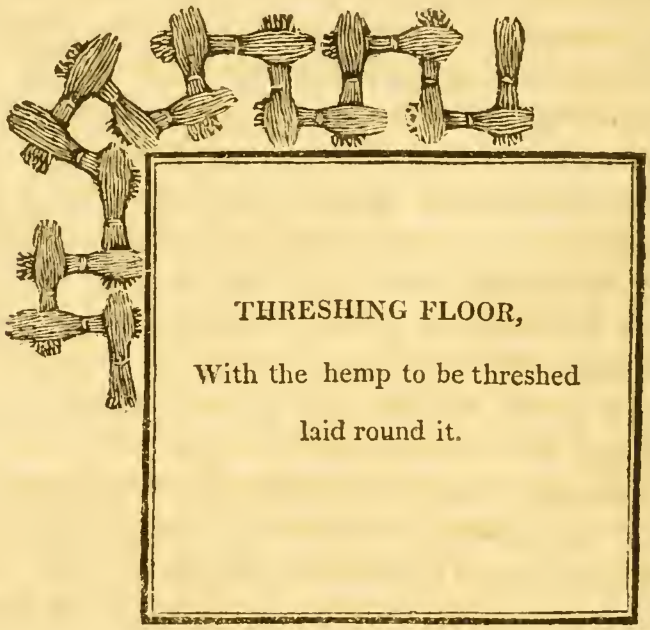
Two bushels are sown to an acre; where more is sown, part of it will die. It should be covered with water twenty-four hours or more. When taken out and put in a tub, and while wet, six quarts of ground plaster of Paris should be put to a bushel, and stirred so as to cover every seed, and immediately

seed sown and well harrowed in; which will make it come up sooner and grow better. If the plaster cannot be conveniently procured, it may be dispensed with. The shade of trees is injurious to its growth. No cattle should ever trample it down while growing. It must never be flooded with water. When three or four inches high, a bushel of plaster of Paris may be strown on an acre, sparingly where the crop looks promising, and more plentifully where it is poor.

Pulling. If no seed is to be saved, the whole field should be pulled in August; when the farina falls from the male hemp on being lightly moved, and the leaves drop therefrom, and the stalk of the male hemp turns yellow. Men accustomed to the business pull a quarter of an acre for a day's work. It is spread on the land to dry, from four to six days. When dry, it is taken up and bound, with rye straw, in small sheaves, of two inches diameter, towards the top of the sheaf. As the sheaves grow drier and shrink in size, the bands are crowded nearer the roots to make the sheaves tight. They are then covered where sufficient barn room can be spared; or carefully stacked up in the field upon some boards or straw to prevent the rotting of the hemp on the ground. Some sheaves of straw should be on the top of the stacks, to prevent the rains from penetrating into them, which will very much injure them. All the hemp which is wet in the body of the mow or stack, is rotted and ruined thereby.

Saving the seed. Where seed is saved, it should always be from the largest hemp. At the time above mentioned for pulling the hemp, about half the land should be pulled all clean in strips or spaces about eight or ten feet wide, and the hemp spread thereon. Then spaces of seven or eight feet wide should be left for seed. What is then pulled, should be treated as above mentioned; the pullers of the hemp go through the spaces where the hemp is pulled, and reach in and gather out by hand all the male hemp, (which is called *thimbling* it,) and spread it on the other hemp; for if left it will dry up, and rot. A threshing floor should be prepared in some convenient place before the pulling of the seed hemp, by removing the loose earth to the sides of the floor, and then treading the ground down tight and hard.

The female hemp must stand four or five weeks longer than the other to ripen the seed. It must then be frequently examined, when some of the seed begin to turn brown, and shell out a very little when moved, the whole must be then pulled, and carried to the floor in unbound parcels of the size of a middling sheaf. The root end of the parcel is laid very near the floor, and at right angles with it—the second parcel is put at right angles with the first, with the seed end across the root end of the first—the third parcel is laid at right angles with the second, with the seed end across the root end of the second, and so to go round the floor. In like manner a second and third row are made round the floor, if needed, according to the annexed draft. In this way of



THRESHING FLOOR,

With the hemp to be threshed laid round it.

laying it the seed end of every parcel lays across the root end of the former parcel, and none of the seed ends come to the ground. When taken up to lay on the floor for threshing (after laying one or two days to dry) it must be handled very carefully to save all the seed. It is then threshed with flails. When threshed the parcels are shaken over the floor to save the loose seed. It is then bound into sheaves, and set up in parcels of six or eight sheaves to be further dried for one or two days, and then threshed again. The seed is then cleaned up, and spread on a floor to be dried, to prevent its spoiling. The hemp is then secured as above directed. The seed hemp be-

ing larger stalks than the other hemp, requires a little shorter time to rot it in the water, than the hemp which was first pulled. Much of the hemp seed will be broken and spoiled if threshed on a barn floor with a flail. If threshed on a floor, a stick much lighter than a flail should be used.

Rotting the hemp in water. Clear, soft, standing water is best for rotting the hemp. A short dam is generally erected across a brook to raise the water from four to five feet, with a sluice way and gate to draw off the water when necessary. The sheaves should be laid down in the bottom, and timber, plank and stones must be put thereon to keep the hemp under water. The dam gate being shut down, it is so to remain till the rotting is finished.

If it is necessary to rot two parcels in the same place, in one year, as is commonly the case where considerable is raised, the first parcel should be put into the water in September; it will then be sufficiently rotted in eight or twelve days, according to the warmth of the weather and water; great caution is necessary in rotting early in the season—the warmer the water, the sooner it will rot. In warm weather the hemp will be much injured by being kept two or three days too long in the water. When nearly rotted some should be taken out every day to dry and to try it, to prevent its being over rotted. When sufficiently rotted, as it will be from eight to twelve days, the water is drawn off, and the hemp remains twenty four hours to drain. It is then carried to grass ground, and spread about two inches thick to dry. After a few days it is turned over, and when sufficiently dry, bound in sheaves and set up into shocks of twelve to sixteen sheaves, where it stands till dressed out in clear frosty weather the following winter.

The second parcel should be put into water about the middle of October, and taken out in twenty or thirty days; the water being then cold, there is much less danger of over rotting it, than when the water is warmer; for two or three days will not then much alter it. When nearly rotted, some should be frequently taken out to dry, to prove it as above. When sufficiently rotted, the water is drawn off and the hemp taken out and laid on the adjacent land in the sheaf till dried or frozen till the sheaves will stand up; the sheaves are then set up against

fences, or in small stacks of twelve to sixteen sheaves in a stack, to stand and dry till fit to dress out in dry winter weather.

There is much less labour and less danger of rotting it too much when the weather and water are cold, than in warm weather. It is therefore advisable to delay putting the hemp into the water till October, if the quantity to be rotted can all be done at once.

Dressing the hemp. It is first broken in a coarse, long brake, the slats of which are about twice as far apart as in common flax brakes. It is then broke in a finer brake, similar to a flax brake, but somewhat longer. If the hemp is suitably rotted, most of the sheaves come out by braking and moderately shaking it. It is then swingled but a little, and very carefully, and the sheaves will shake out. When from nine to twelve feet long, as it sometimes is, it is cut in two to be dressed. Two hundred weight is a week's work for a raw hand to dress, but expert workmen will brake and swingle three hundred in a week. The sheaves are put in the barn yard, after the manure is all carried out.

Produce. Hemp produces from four hundred to eight hundred weight on an acre. The price from eight to twenty dollars an hundred. The seed gathered from an acre, is from six to nine bushels, and is worth from two to ten dollars a bushel. It is a profitable crop. Our farmers think they can make more by hemp, than by raising grain, or any kind of stock. It always brings cash. From *thirty* to *forty* dollars an acre is paid yearly, for the use of land fitted to raise hemp on.

A new kind of hemp. A late English author says—the Chinese hemp (Crotolaria *Juncea*) is said to be of a quality superior to the common hemp. In an attempt to cultivate it in England, it grew upwards of twelve feet high, and nearly seven inches in circumference, but the seeds will not ripen in England. The Chinese make paper of it.

Some of the captains of the American East India Ships may render an essential service to their country, by bringing some of the Chinese hemp seed to the United States for cultivation.

JUSTIN ELY.

West Springfield, January 26, 1814.

ON THE WILD OAT GRASS.

If the grass mentioned in the following extract is the same which has been lately cultivated on Connecticut river, and the seed of which was sent to Boston by the Hon. Justin Ely of West Springfield, under the same name, we can only say that from what we have seen of the plant, in the small specimens exhibited in our vicinity, it promises much.

It is really a species of oat (avena), and if the gentleman who sent us the following extract is right in considering the grass mentioned by the German writer, a bromus or festuca, they are certainly different plants, though ours was introduced by the name of "wild oat grass."

There are many points of resemblance between the grass lately recommended by Mr. Ely, and the grass described by the German writer. But it is impossible the grass we have could have been mistaken for a bromus or festuca. It is hoped that some gentleman will send to Europe, and procure the seeds of this grass so highly recommended.

UPON THE CULTIVATION OF WILD OAT GRASS,* AS ONE OF THE BEST HAY GRASSES TO BE RAISED FROM HEAVY, MOIST, AND SHADY GROUNDS.

[Translated from the German.]

The wild oat grass, the bromus giganteus of Linnæus, is a stem grass. It sends up very beautiful succulent stems, to the height of five feet. Its leaves of a clear green, are two feet in length, and an inch broad. The panicle is pendent, and the spikelets contain from four to six florets. The root firm, di-

* The original futtruturfyr is rendered "wild oat grass" for want of any other English name. Ray, in his *catalogus plant.* [p. 106] seems to have given it this name; he makes it of the genus *festuca.* Linnæus, however, and his successors, class it as a *bromus.* He describes it as "of the height of a man, leaves a finger's breadth, panicles at each joint of the stalk send out two peduncles, the root perennial, which in the other *bromi* is annual. [Flora Suecica 99.] Found in the dry woods of Europe." [Species Plant. 114.] It is *Triand. Digyn.* Dr. Rees inclines to follow Ray, in calling it a *festuca.* [*Trans.*]

vided into fine filaments, perennial. Though this grass is later in season than all other grasses, and does not bloom till July and August, yet it continues in bloom proportionably later, even till Michaelmas, and is green even till the end of November. It delights in a heavy, moist, and shady soil, does not refuse the closest loam, and will thrive in shady, moss grown spots, (such as we often find in the bosom of forests) also under trees, however close and thick, and even in shades impenetrable to the sun, where no other grass will thrive. But if it be taken into cultivation, and placed in soil but little manured and loosened, so it be not quite dry, it will thrive to admiration, and acquire great estimation for its unequalled increase. If you choose to let it run to seed, you will find it prolific, and the straw it yields is for length and firmness not surpassed by the finest ——— straw. It may be sown in shady fields, but then, like all perennial grasses, the first year's growth is tardy; the second year it is better, and reaches its perfection. The best season for sowing is the spring. It will be well, under thickly placed trees, if the ground to be sown be loosened with the spade, as if for a garden. In other fields, where there are no trees, the plough will do this sufficiently. As this is a late grass, it may be sown to advantage in good soils under barley, like other grasses. In this case thirty pounds of seed will be enough for an acre, and the process, like that which I have advised in the cultivation of honey-suckle, french, and other grasses. From forty to forty-five pounds of seed is the quantity to an acre, where this is the original crop.

In the second year, by which time it reaches its maturity, it may be mown twice. It is better though to cut it early, before it has thrown up the stems, and then you may mow it at least from three to four times. Although, as was hinted, it is none of the earliest of grasses, yet it remains later than any other hay grass in a verdant state, and is fresh and lively at a time when the rest of the vegetable kingdom is shrinking at the first blasts of winter. Those, moreover, who make a rowen of this grass, and sell it by weight, will find no small profit in its peculiar heaviness; and a dry, heavy rowen is the best. This grass is, if I may say so, a sort of grain, and is very grateful to cattle. It is rare that you find the leaves of any other

grass broader or longer, and withal more soft, succulent, and relishing. It accordingly agrees extremely well with cattle, and they may be fatted upon it, if given to them green or well cured. It may be sown under clover, and will thrive well; and the clover mixed with this grass, has the property of preventing the colic of animals. This is one of the good grasses, with which you may lay down new, sound, and rich meadows. For this purpose it should be mixed with the seed of honey-suckle, and French-ray grass, and yellow —— grass, and from six to eight pounds of each kind be sown to an acre. The ground should then, for the first year, be secured from cattle and sheep, and in the second year you will have a meadow which will henceforth produce the best, most nourishing, relishing, salutary, and abundant feed for cattle and sheep.

CHARLES EDWARDS' MACHINE FOR KILLING TICKS.

Mr. Edwards' smoking machine for destroying ticks will no doubt prove a valuable acquisition to the sheep-holder.

LETTER FROM MR. EDWARDS.

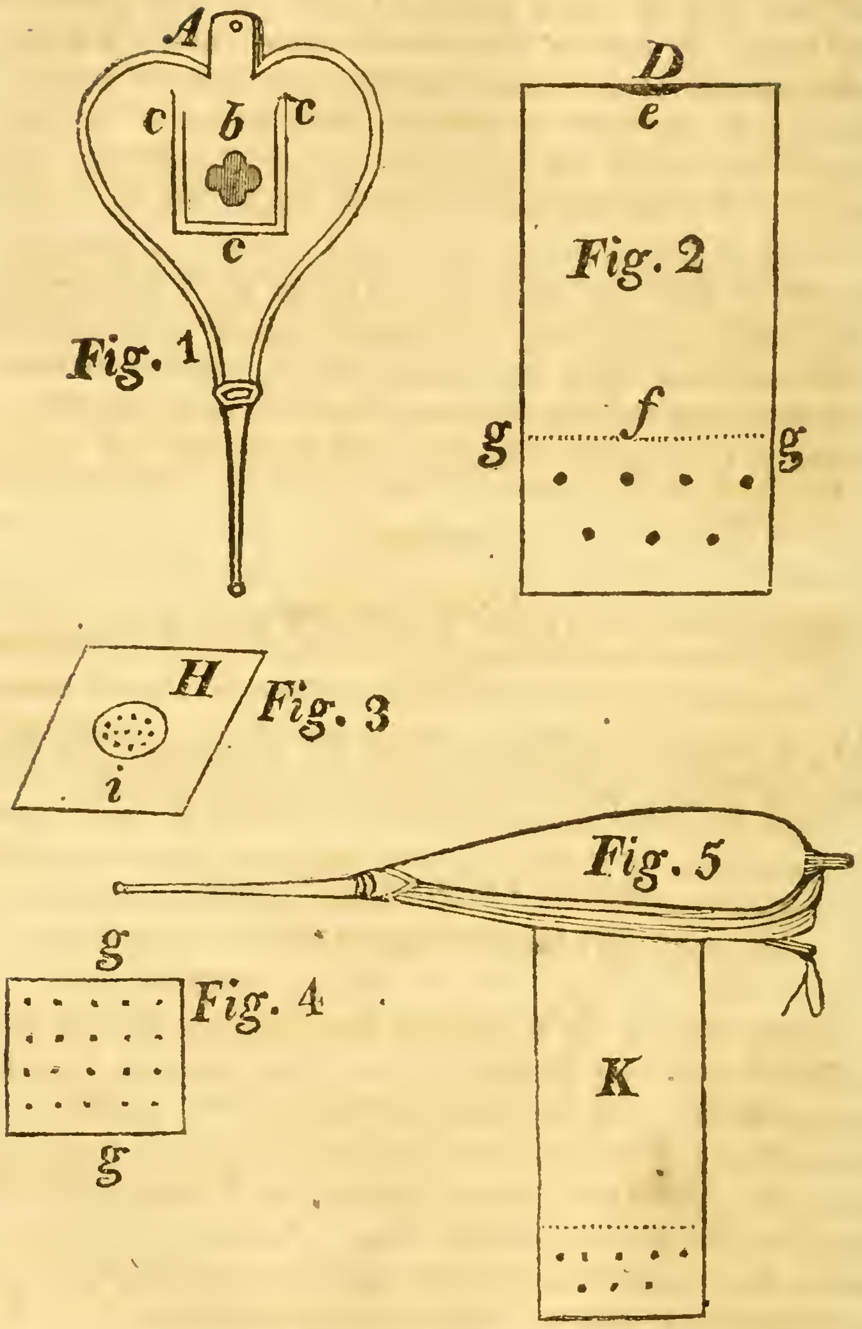
[To the Recording Secretary.]

SIR, *Boston*, 22 *March*, 1814.

I beg leave to lay before the Massachusetts Agricultural Society a machine I have lately invented for destroying ticks in Merino sheep by smoking them with tobacco; its construction is simple, and the expense trifling, the whole apparatus, including the bellows, may be had for two dollars if made of tin, and if of sheet iron for three dollars fifty cents. The bellows can always be used for domestic purposes, as the cannister can be taken off at pleasure: should the society deem it worth their acceptance, I shall be highly gratified. It has been much approved of by several gentlemen to whom I have loaned it as a pattern.

CHARLES EDWARDS, *Merino Agent.*

SMOKING MACHINE.



EXPLANATION.

Fig. 1. *A* a pair of common bellows; *b* the valve of the same; *c c c* the grooves into which the edges of the cannister slide.

Fig. 2. *D* The tin cannister, measuring six by four inches, contain-

ing the tobacco. *e* The mouth of the cannister, where it is charged. *f* A false bottom (perforated) inside the cannister, which admits the air. *g g* Air holes in the sides communicating with the false bottom.

Fig. 3. *H* The sliding top to the cannister, (perforated at *i*,) which is put on after the tobacco is lighted, and prevents the cinders from burning the valve of the bellows, yet does not obstruct the draft.

Fig. 4. *g g* The false bottom inserted inside the cannister at *f*.

Fig. 5. *K* The machine complete, and ready lighted, the nose of the bellows is inserted in the fleece, and the operation performed with ease.

Note. A decoction of tobacco, applied in the following manner, as a remedy for the *scab*, has been found also to destroy ticks—part the wool along the spine with the hands, so as to leave the skin exposed; place the vessel which contains the liquor in contact with the skin, and pour gently, continuing the operation until you have reason to think the liquor has diffused itself over the whole body. The wool receives no permanent stain from the tobacco.

INQUIRIES.

With a view to collect the most accurate information on the principal branches of agriculture, as now practised, and thus be enabled to propagate the knowledge of whatever shall be found useful, and to open the way for future improvements, the following inquiries were sometime since addressed to gentlemen in various parts of the state; by the trustees of the Massachusetts Society for promoting agriculture. The answers subjoined are from the "Shrewsbury United Agricultural Society."

Question 1. Of what quantity of land do the farms in your vicinity generally consist?

Answer. On an average about one hundred acres.

Q. 2. What is the quality of the soil?

A. Moist, and in some places stony; black, red, and yellow loam, with a mixture of clay.

Q. 3. Into what portions of pasture, mowing, and tillage, orcharding, and wood, are farms usually divided? Are the orchards improving or declining? Do they yield a competent supply of cider?

A. One third mowing, one third pasturing, about one third of the other third is tillage land, the rest woodland; orcharding

included in mowing and pasturing; generally the spontaneous growth of apple trees is the most thrifty, the most productive, and the most durable; appropriate orchards are more exposed to canker worms, and are generally on the decay in this vicinity.

Q. 4. How much land on each farm is annually (on an average of years) planted or sown with grain of any kind?

A. This depends on the size of the farm, on the soil, and the ease with which the lands are tilled. On farms of sixty or seventy acres there is planted and sown from ten to twelve acres annually.

Q. 5. In what manner is the land prepared, manured, and seeded with each kind of grain, and what is the medium crop?

A. For rye, old fields are generally ploughed in June; about the first of September the furrows are crossed with a harrow; the rye is then sown, and the harrow drawn over again to cover it. On new land the brush are cut in June, and burnt about the last of August; the ground is then ploughed, the rye sown, and harrowed in as before. Oats, barley, and spring wheat are usually sown on fields where corn has been raised the year before; the corn hills are ploughed about the the first of April, the ground is passed over with a harrow, the grain is sown, ploughed in with a light horse plough, and then, if grass seed is sown, it is smothered again by a bush harrow; if the season will admit, it is better to get in wheat the latter part of March, the earlier the better. No manure is put on the ground at the time of sowing rye, oats, barley, or wheat, but oats, barley, and spring wheat are sown on cornfields usually which have been well manured the year before. For corn the ground is generally ploughed in June, if other business will permit, sometimes the last of August, and sometimes later, for the next season. On the ensuing spring the manure is carted on the furrows; the furrows are then cross ploughed, and sometimes harrowed; the rows are then struck out with a horse plough at the distance of three and a half feet, one way, and three feet the other; a shovel full of manure is put into the hill, then the corn is dropped and covered; care enough is not taken in dropping corn to spread the kernels about three inches apart to prevent the roots from crowding too hard; five kernels are put into a hill. The quantity of rye raised on an acre will average about 15 bushels, oats 35, barley 18, wheat 12, and corn 35 per acre.

Q. 7. What is the quantity and value of the straw on an acre of barley, rye, oats, and wheat respectively? and to how much upland hay are they respectively equivalent for fodder?

A. From fifteen to twenty hundred weight each. Barley and oat straw may be equivalent to one half the quantity of upland hay, wheat straw to one third, rye straw is worth but little for fodder.

Q. 8. What is the value of straw of each kind for any purpose, either for fodder or litter?

A. Rye straw is valuable in making cider, and also for making braid for bonnets; for the latter, great use is made of it in this and other parts of the country; other kinds of straw are but of little use except for fodder or litter.

Q. 9. What is the value of the stover or stalks on an acre of Indian corn, and to what quantity of upland hay is it equivalent for fodder?

A. The stover that may be saved on an acre of Indian corn is worth, to be made use of in a stock of cattle in the winter, as much as from twelve to fifteen hundred of good upland hay.

Q. 10. What quantity of land on a medium farm is annually planted with potatoes? How is the land prepared? What quantity and kind of manure is applied to an acre, and in what manner? How much seed is used, and how is it selected? How are they cultivated, and what is a medium crop?

A. The land planted exceeds one acre, and is prepared by being ploughed twice, and sometimes is harrowed. Twelve loads compost manure are applied to an acre, and generally put in the hill. The quantity of seed is twelve bushels, and but little attention generally is paid in selecting it. They are cultivated in hills, hoed twice, and yield one hundred and fifty bushels per acre.

Q. 11. How many bushels of potatoes are equivalent to one bushel of Indian corn, for sale?

A. Three bushels.

Q. 12. How many days labour of a man are usually employed on an acre of Indian corn, including the getting in all the stover, and stripping the husks from the ears?

A. Sixteen days, including oxen, and cart, and plough, calculated as follows, viz. ploughing one acre twice is two

days work, for a man, and two for a boy, equal to one of a man, making three days, four oxen the first ploughing being one day, equal to a man one day, second ploughing, one yoke of oxen, one day, equal to a man a half a day, one man and four oxen one day carting and spreading manure, equal to a man two days; furrowing out the ground and planting, including boy, corn, and plough, equal to a man one and a half days; ploughing and hoeing the corn three times, including plough and horse, equal to a man four and a half days; cutting stalks, securing them, and harvesting corn, three and a half days; total, sixteen days.

Q. 13. What is the labour of shelling a hundred bushels of Indian corn, and in what manner is it performed?

A. It may be performed by one man in two and a half or three days, by being put into a tub or rack, and pounded off with a wooden mall made for that purpose.

Q. 14. How many days labour of a man are usually employed on an acre of potatoes, including the getting in the crop?

A. Seventeen days; including oxen, cart, and plough.

Q. 15. Is there any order or succession of crops known to be beneficial or pernicious to the soil? If any, what is it?

A. A change of crops is generally practised, not so much because any order or succession of crops is thought to be beneficial or injurious to the soil, (though some may be more so than others,) as because there is not manure enough made to manure all the tillage land in each year. So long as there is not manure enough, for all the tillage land, so long a succession of crops may be necessary in order that each part of the tillage land may receive its proportion of manure. Such crops as require much nourishment to bring them to maturity, and when gathered leave little or nothing on the ground to enrich it in return for what it has received, will impoverish the land; among these corn may be accounted the principal, while on the other hand, potatoes in successive crops may be considered beneficial to the soil, on account of the manure made from the vine, and stirring of the earth late in the fall, in digging them; nor do they exhaust the land so much as corn.

Q. 16. What is the usual course of crops?

A. When new land or grain land is ploughed, the first crop is ordinarily rye or potatoes, then interchangeably Indian corn or potatoes, and oats, barley, or flax; potatoes are ordinarily considered as best to precede flax, probably because the ground being stirred towards the winter, by digging the potatoes, it is not so much infested by worms and other insects which devour flax the next year.

Q. 17. What is the medium quantity of hay produced on an acre of upland, and what is the labour of mowing, curing, and housing it?

A. The uplands in this vicinity will not, on an average, produce more than twenty-five hundred per acre, except by sowing plain fields with clover and herds grass seeds, two or three years after tilling and manuring them, when they will produce two tons per acre for two or three years, when they may be fed or ploughed. The labour will depend on the quantity produced, and will on an average be two days work of one man beside the ox work.

Q. 18. What is the medium product of hay on an acre of fresh meadows, and what is the labour of mowing, curing, and housing or stacking it?

A. About one ton; the labour to be bestowed about three days for one man.

Q. 20. Is there any tillage land laid down with grass seeds, without sowing grain at the same time? If so, which method is found best?

A. None in this vicinity.

Q. 21. What are the kinds of grass cut on the upland for hay? what proportion is from seed sown by hand, and what are the kinds thus sown, and in what quantity respectively per acre.

A. Kinds of grass cut on upland are red and white clover, herds grass, spear grass, red top, and Cambridge grass, so called. The proportion of seed sown by hand, is about one half; grass seed generally sown is red and white clover, and herds grass. The quantity of seed sown on the acre is about five pounds of clover, and four quarts of herds grass upon land in a middling state of cultivation; the higher the state of culti-

vation, the more seed is necessary, otherwise the grass will be too rank.

Q. 22. Are any grass lands now seeded after scarifying them with the harrow only, or in any other mode without ploughing? and what is the success of such practice?

A. None in this vicinity.

Q. 23. What weeds, vermin, or insects infest the mowing lands?

A. White and yellow weed, but little; some years many mice, moles, and grasshoppers.

Q. 24. Are the spontaneous or cultivated grasses infested most?

A. The spontaneous.

Q. 25. What methods are used to destroy weeds, vermin, or insects, without ploughing the land, and what is their success?

A. Little attention is paid to destroying vermin, except canker worms and caterpillars; the first by tarring the trees, which is the only effectual method that has been found in this vicinity, and the other, to wit, the caterpillars, by taking off the bunches or gums with the eggs in them towards winter, or by destroying their nests soon after they hatch in the spring, by putting strong soap-suds or fish-oil into them; laying a sod of earth in the crotch of a tree has been found early in the spring to check their progress.—Of weeds, the yellow and the white weed are the most troublesome; we know of no effectual method of destroying them, but digging or pulling them up. Sheep will check them, and so will mowing them early, before the seed is ripe. Gypsum or plaster of Paris has lately been found effectual for destroying white weed.—The Canada thistle is creeping into our pastures.

Q. 26. What kind of beasts, and in what numbers are they respectively kept on medium farms? and how are they subsisted?

A. A farm of 100 acres of a medium quality, that is economically cultivated, keeps well the following variety and numbers of beasts: viz. 15 head of horned cattle; consisting of 2 oxen, 7 cows, the residue in young stock of various ages, together with 1 horse, 12 sheep, and 6 swine.

Q. 27 In what place, and in what manner, are cattle fed with the coarse winter fodder? Is it given in the stable, in the yard, or in the field? Is it chopped, or given whole.

A. In the stable; and in the coldest weather in the yard also; always given whole.

Q. 28. How much butter is usually made in a year from one cow, all the cream being churned; and how much skim milk cheese is made from the same cow?

A. From a medium cow, 100 pounds of butter are made in a year, all the cream being churned, and 150 pounds of skim milk cheese, all the milk being used for that purpose.

Q. 29. What food is usually given to sheep besides grass and hay?

A. A small quantity of corn or oats in the winter, especially for ewes, five or six weeks, and turnips or potatoes two weeks before they lamb, to increase the quantity of milk, and render it more safe and suitable for the support of the lamb. If the sheep lamb before they go to grass, the milk is apt to be too thick and sizy, unless they have potatoes or turnips.

Q. 30. What is the value of the subsistence of a sheep through the year, besides the pasturage?

A. Sheep need but little food dealt out to them while the grass is not covered with snow, the pasturing of five sheep is 25 cents per week, which is equal to the pasturing of one cow; but during the winter season they should have a little corn, and sometimes potatoes.

Q. 31. What is the value of pasturage for a sheep, compared with the pasturage of a cow?

A. Five sheep are considered about equal to one cow; the cow 25 cents per week, the sheep 5 each.

Q. 32. What is the ordinary weight and value of the flesh of a sheep when fit for the butcher? and what is the quantity of wool in a fleece?

A. The ordinary weight of a sheep is about fifty-six pounds, and the value four dollars forty-eight cents, or eight cents per pound, and the quantity of wool on the same sheep, three pounds.

Q. 33. What breed of swine are propagated? How are they fed? how fatted? at what age are they killed, and what do they then weigh?

A. The Byfield and the Russia; but there are various other kinds; we think the Russia to be the best; they are generally fed through the first winter on potatoes; some given raw, and some boiled with a little meal, then mixed with them: they are generally fatted with a provender of corn, or oats, ground into meal; some are killed from nine to twelve months old, and weigh from two to three hundred; others are killed from twelve to twenty months old, and weigh from three to five hundred, and some weigh more.

Q. 34. What number of bee hives are kept? what is their product in honey and wax? what is the management, and what are the obstacles which discourage their extensive propagation?

A. Bees are diminishing in this vicinity, and the product in both honey and wax is small in most hives. Bees do not flourish in old settlements as in new—perhaps because of the different stocks, and their nearness together in old settlements, whence arise wars and fightings among them, and they destroy one another. Another reason may be the want of that rich variety of those productions of nature with which new settlements abound; the best substitute for these is thought to be the culture of buckwheat; being what bees in the season of it prefer to any other flower among us.

Q. 35. What is the usual quantity of land sowed with flax seed? how is it manured and cultivated? and what is the medium product of flax and seed in quantity and value?

A. The soil has so long been cultivated in this vicinity, that flax does not do well here, and very little is raised among us.

Q. 36. How much labour is employed on a quarter of an acre of flax before it comes to the spinner, and including the preparing of the seed for market?

A. Fourteen and a half days.

Q. In what articles consists the surplus of the farmer which is sold or exchanged for other articles?

A. In this vicinity the principal articles of surplus are pork, beef, butter, and cheese.

Q. 38. How many loads of manure are collected (30 bushels to the load) from the cattle in the barn yard of a medium farm in a year—specifying the number and kinds of cattle kept on the same farm, and the manner in which they are kept, in relation to confinement, or ranging abroad?

A. A ton of hay will make a load of manure of 30 bushels to the load, and the quality of manure will be in proportion to the quantity of hay—two tons of hay are allowed for the wintering of an ox or a cow, and two loads of manure of 30 bushels each expected for each ox or cow in that time, and about half that quantity of manure in the summer, if the creatures are yarded during the night, and about four loads from a horse if stalled the whole year.

Q. 39. What quantity of manure is made in the hog-pen—specifying the number of swine fatted, the kinds and quantity of food consumed, and the weight of flesh produced?

A. The result of this question depends much on the breed of swine selected for the above experiment, and also on the quantity of materials carried into the hog yard for the purpose of making manure. Let the hog yard be about forty feet square, including a shelter that will render their lodging warm and dry, put therein the latter part of May five pigs that are six weeks old, of the most improved breed, then cause the several kinds of materials, best adapted for making hog manure, such as meadow or pond mud, loam, or wash of roads, together with any kind of green vegetable, to be carried into the yard, at suitable times, keeping the several kinds properly proportioned; let the manure made the first year, be removed out of the yard the next spring, and the yard stocked with materials as before, by which mode of management not less than seventy loads (of thirty bushels to a load) of manure in the course of two seasons may be obtained, and of the first rate for drills or holes. Let the said swine be fed in the ordinary way till they are about sixteen months old, from which time give them meal made of corn and oats, only a third of the latter, together with potatoes boiled or steamed, and properly mixed therewith, until they have consumed 75 bushels of meal, and 90 of potatoes, and given them in as short a time as they will eat their meals clean—

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then let them be killed—weight of flesh produced rising of one ton.

Q. 40. What methods are used to enlarge the quantity, improve the quality, or prevent waste of the manure made in the barn yard or hog pen, and especially to save the stale of the cattle ?

A. Within a few years the quantity of yard manure in this vicinity has been increased to a considerable degree by having mixed with it meadow mud, loam, wash of roads, straw, weeds, &c. Some pains is taken to prevent in great rains the water that falls in the barn yard from running off, which if it does, not only the quantity is lessened, but the quality of the manure is injured.

Q. 41. Is the manure and tillage labour exclusively applied to the best parts of each farm ?

A. Generally, and that is one great reason why some parts of a farm continue to be so much better than others.

Q. 42. In what manner, and for what purposes is manure used, except those indicated in the foregoing inquiries ?

A. We know of none in this vicinity.

Q. 43. What other manures are used besides those created by the stock, and what are their merits compared with these ?

A. Besides the manure made by the stock of cattle, considerable is made by swine, which is superior to any other, if properly fermented and rotted—also street manure is much used, where it can be collected in hollow places by the sides of the way—also the wash of adjacent lands when it can be collected, and turf and mud from dykes and ditches when well rotted, and mixed with the manure of stock, are so far meliorated as to render the whole on grass land equally valuable with so much clear stock manure.

Q. 44. Is lime stone found in your vicinity ?

A. There is none.

Q. 45. Is buckwheat cultivated for the food it yields ? or is it used to cleanse the soil from weeds, to fertilize and enrich it, or for any other purpose ?

A. It has not been sufficiently cultivated in this vicinity, as yet, to discover its usefulness for any purpose.

Q. 46. In what manner are new lands brought under cultivation? Is it customary to plant orchards in the new settlements?

A. This question we leave to be answered by people of new settlements.

Q. 47. How is land cleared, which bushes and underbrush have overrun, since the trees were carried off?

A. The best way to clear and subdue bushes is by ploughing and planting with potatoes, which leaves the land in fine order for Indian corn or English grain—mowing them twice a year for two or three years will kill them, but is more expensive than ploughing.

Q. 48. What is done with swamps or swampy lands?

A. Some are drained by ditching, and mowed, and sometimes thickly coated with stones, gravel, wash of roads, and manure, which makes them productive of large crops of hay of a good quality; the mud is often carted out of them to mix with stock manure.

Q. 49. Is the growth of wood for timber and fuel equivalent to the consumption in your vicinity? if not, what measures are taken to provide against the inconveniences of future scarcity?

A. The growth is equal to the consumption.

Q. 50. Are wood lots generally fenced, or left open for cattle to range in without restraint? In getting your wood for fuel do you pick the oldest trees, or do you cut clear? Which method is best calculated to increase the value of your wood lands?

A. Wood lots, in this vicinity, are generally fenced, and it is thought most advisable to cut out the oldest trees, and such as have been broken by wind, or are decaying by accident; by that method a wood lot of thirty acres will supply a family with twenty cords of fuel, without diminishing its value—whereas, while we are cutting one part clear, there will be considerable annual loss in the other.

Q. 51. What are the causes that the culture of wheat can no longer be pursued on the sea coast of New England?

A. The blast upon wheat we suppose to be the reason why it cannot be cultivated near the eastern shore; on the south shore it is understood they cultivate wheat as formerly.

If strong east wind is the cause of blast, it may be thus accounted for, those winds being very powerful, and carrying their noxious qualities farther, as the country is laid open.

Q. 53. Is the European practice of a succession of crops found to be expedient in this country, and in what order ought such a succession of crops to take place?

A. In this vicinity a succession of crops is practised, but not so much because it is necessary, as it is convenient for want of sufficient manure for the whole ground.

Q. 54. Is it perfectly ascertained, that with attention to manuring the land, it is more advantageous to change the crops than to keep it in grass?

A. There can be no doubt, since plaster of Paris has been in use among us, that all land can be made with water, manure, and plaster, (some with one, and some with the other,) to yield grass so advantageously, that nine times out of ten it is better to keep even old fields to grass, than to plough them up.

Q. 55. Is there any crop so profitable as grass, taking into consideration the state of markets in our country, and the distance that most of our farmers are from market?

A. At the distance of thirty miles from the market, none so profitable as grass.

Q. 56. Can farmers raise any crop which, on the whole, affords them so great a profit as grass, unless they are within twenty miles of the capital?

A. Grass and feed afford the greatest profit, and with the least labour and expense, and when made into hay is more lucrative than a crop beyond the specified distance.

Q. 57. What are the most profitable crops which the state of Massachusetts, taking one year with another, furnishes?

A. Averaging the distance from the markets, and the difference of soil, the crops that are usually raised, such as grass corn, rye, barley, oats, and potatoes, &c. if the farmers are correct judges of their own interests, we must think to be the most profitable.

Q. 58. What has been found to be the difference of profit between the Merino sheep, and the sheep which formed our former stock?

A. We have not had sufficient knowledge of the clear Merino to give an answer—but the half Merino are thought to be double the profit of the sheep which formed our former stock.

Q. 59. Is there any cheap fodder which can be raised for sheep during the winter, which will supercede or diminish the consumption of hay?

A. There is none known in this vicinity.

Q. 60. What is the comparative profit of a farm adapted to the raising of sheep, between the cultivation of Merinos, and the aising of any other cattle.

A. We are unable, at present, to answer this question, as Merino sheep have not till lately been introduced in this to vicinity.

Q. 61. Is there any profit derived from the raising of Indian corn, except for the subsistence of man, which can equal the employment of the same land in raising grass for the support of sheep and cattle during the winter? What are the calculations on which such profits are founded?

A. It is not generally considered profitable in this vicinity to raise more corn than is necessary for making bread and fatting meat for family use.

Q. 62. What are the improvements in dairies, which have been made within the last twenty years? Is the quality of butter and cheese improved? and in what consists this improvement? and what are its causes?

A. There are none that we know of.

Q. 63. Are there any improvements in the tools of husbandry, which experience has confirmed, and what are these improvements?

A. None.

Q. 64. Are there any new and valuable fruits or productions, either contributing to the pleasure or profit of the citizens at large? What are they? What the mode of culture, and what their qualities?

A. None in this vicinity.

Q. 65. Are there any improvements in the breed of cattle? What are they, what their qualities, and where can they be obtained?

A. The breed of cattle kept in the New England states, and especially in this vicinity, have been greatly improved by selecting the likeliest heifers for breeders—to determine which much regard is had to the form and make of the animal: viz. such as are of a bright countenance, straight back, round ribbed, low and thick built: such coupled with bulls of the above description together with proper keeping, has not failed to produce stock, that for beauty or size has not been surpassed by any breed of cattle that has ever been introduced in this part of the country–there has within a few years been many oxen fatted in this vicinity, which weighed from 13 to 16, and some rising 17 hundreds a bullock.

Q. 66. Are there any other improvements, not comprised under the articles of manufactures which have been made in any branch of agriculture?

A. None that we know of.

At a stated meeting of the Shrewsbury United Agricultural Society held on the first Tuesday of November, A.D. 1813:—

Voted, That the secretary of the Society be requested to transmit an attested copy of the foregoing answers to the several questions to which they are respectively attached, to the Massachusetts Society for promoting Agriculture.

True copy, *Attest,* U. HEMENWAY,
Secretary of S. U. A. S.

WEEDS.

INJURIOUS TO ARABLE LAND.

[Selected.]

Couch is the proper name of the Triticum *Repens*, but is frequently applied to other grasses, which have a perennial creeping root; as the Bent Grasses, (Agrostiss,) Creeping soft Grass, (Holcus *Mollis*,) Tall Oat Grass, (Avena *Elatior*) and some others.

They are destroyed by repeated summer ploughings, or by forking them out and burning them.

Among Sharp's plates, containing figures of new invented implements of husbandry, is a jointed horse-rake for pulling up Couch-grass.

Coltsfoot, (Tussilago *Farfara.)* The way to destroy this weed is by cutting it up in those months when it begins to throw its flower; at which time it will bleed to death.

Charlock is the Raphanus *Raphanistrum*, but the following plants, equally noxious to the farmer, pass under its name—viz. Wild Mustard, (Sinapis *Migra,)* Wild Rape, (Brassica *Napus.)* These plants are annuals: their seeds will lie in a clod as safe as in a granary, and vegetate at the end of twenty years, when ploughed up and exposed to moisture.

They are to be extirpated by ploughing them under when the field is fallow, or by weeding them out of the crop before their seed shall have been ripened. The same method must be pursued with other weeds.

Melilot, (Trifolium *Melilot-Officinalis,)* White Darnel (Lolium *Temulentum,)* and Garlic, (Allium *Oleraceum,)* require particular care to destroy, as they not only injure a wheat crop when growing, but lessen its value at market, by communicating a most loathsome flavour to wheat and other grain, so as to render it unfit for making bread. Stinking Chamomile, (Anthemis *Cotula,)* where it abounds is often found to blister the hands of weeders and reapers.

Corn Marigold, (Chrysanthemum Segetum.) The noxious weed is said to be destroyed by dunging the soil where it grows, in autumn; letting it lie fallow one summer; and harrowing the ground in about five days after sowing the seed for the future crop—also by manuring with chalk.

Thistles, cut an inch above the ground, will not be so formidable at harvest as those cut at the same time with the hoe, and below the surface. In the former case, the remaining stub of the thistle gets filled with water, which resting upon the crown of the plant, injures it so far as to occasion a few feeble shoots only to rise; whilst in the latter, strong and luxuriant stools shoot forth.

If thistles, briers, &c. are cut with a mattock, or spade, in August, they will bleed to death.

Peat dust scattered upon thistles causes them to wither, as if scorched; but they generally recover unless the dust be repeated.

Berberry, (Berberis *Vulgaris.)* This shrub is said to have the quality of blighting the ears of wheat, even to the distance of three or four hundred yards across one or more fields.

Dodder or Hellweed, (cuscuta *Europæa.)* This is a very singular plant; as soon as it creeps up another it quits its root, and is fed by the plant on which it fastens, and its branches will thus run from one to another, a furlong or more. Hops, flax, and beans, are mostly attacked by it. The last is best freed from it by turning in sheep, which both break its branches and feed upon it.

Many weeds are generally introduced into fields by that slovenly practice of suffering them to grow and seed on the dung-heaps.

> "One year's good weeding,
> Will prevent seeding;
> But one year's seeding,
> Makes seven years' weeding."

WEEDS INJURIOUS TO CATTLE IN PASTURE LANDS.

Water Hemlock, (Phellandrium *Aquaticum,)* is generally esteemed a fatal poison to horses, occasioning them to become paralytic; but this effect is owing to an insect, (Curculio Paraplecticus,) which generally inhabits within the stem. The usual antidote is pig's dung; to oxen this plant is both wholesome and agreeable. Horses are said to have been killed by eating the common wormwood, (Artimisia Absinthium.)

Water Cowbane, (Cicuta *Virosa.)* Early in the spring when it grows in the water, cows often eat of it, and are killed by it; but as the summer advances, and its smell becomes stronger, they carefully avoid it.

Water Germander, (Teucrium *Scordium,) Blue Sowthistle* (Sonchus *Alpinus,) Treacle Mustard*, (Thlaspi *Arvensis,)* and common Wormwood, (Artimisia *Absinthium,)* give a disagreeable odour to the milk of cows that feed on them; and corn mint, (Mentha *Arvenensis,)* prevents its coagulation.

Wild Angelica, (Angelica *Sylvestris*,) renders hay ungrateful to cattle ; and *Wall Barley Grass*, (Hordium *Murinum*,) when mixed in hay, proves highly injurious to horses, the awns or beards of the ears sticking into their mouths, and making them so sore that they are unable to eat.

Marsh Marigold, (Caltha *Palustris*,) occasions such an inflammation to cows that eat of it, that they generally die.

Common Lousewort, (Pedicularis *Sylvatica*.) If the healthiest flock of sheep are fed with it, they become scabby and scurfy in a short time ; the wool gets loose, and they will be over-run with vermin.

Common Wormwood gives a bitter taste to the flesh of sheep that have eaten it ; as does *Sun Spurge*, (Euphorbia *Helioscopia*.) One sort of Poppy, (Papaver,) and Mouse-ear Scorpion Grass, (Myosotis *Scorpioides*,) generally proves fatal to sheep.

Shepherds impute the rot to sheep feeding on the Round-leaved Sundew, (Drosera *Rotundifolia*,) Marsh Pennywort, (Hydrocotyle *Vulgaris*,) and common Butterwort, (Pinguicula *Vulgaris*,) all of which grow in marshy grounds. But from an experiment made on purpose with the last, it appeared they did not eat it. It may be made a question, whether the rot in sheep is so much owing to the vegetables in marshy grounds, as to a flat insect, called a *Fluke*, which is found in these wet situations, adhering to the plants, and likewise in the livers and biliary ducts of sheep, that are affected with the rot.

Cow Boletus, (Boletus *Bovinus*.) In cows and other cattle that have eaten of it, it has been known to create bloody urine, nauseous milk, swellings of the *abdomen*, inflammations in the bowels, stoppages, diarrhœas, and death. In sheep they bring on a scirrhous liver, cough, a general wasting, and dropsy.

For Mallows, Docks, and some other deep rooted plants, which, though perhaps not noxious to cattle, are seldom or never eaten, and take up the room of more useful plants, the docking iron should be made use of to eradicate them.

COMPARATIVE DURABILITY OF DIFFERENT KINDS OF TIMBER.

[Selected.]

STATE and condition of several kinds of timber, after being exposed to the weather ten years.

Cedar, perfectly sound.
Larch, heart sound, but the sap quite decayed.
Spruce-Fir, sound.
Silver-Fir, in decay.
Scotch-Fir, much decayed.
Pineaster, quite rotten.
Chesnut, perfectly sound.
White Poplar, sound.
Beech, sound.
Walnut, in decay.
Birch, quite rotten.

Green Fir timber may be seasoned, and rendered fit for immediate use, by soaking the planks or round trees, barked, a few days in lime water; or paying them over with lime along with water. Lime water is made by slacking the lime in water, and the hotter it is used, after the lime is slacked, the better.

Dry-Rot in timber may be prevented by charring the ends of the joints, and by fixing them in anchor smith's or foundry ashes, laid under the flooring. Leaving one of the boards of the floor loose, and removing it at night, is said to prevent it.

The Dry-Rot is owing to yellow Fungi, and to a white mould spread by a plant, resembling a vine or sea weed (Clavaria *Hypoxylon ?)*

Composition for preserving weather boarding; which is impenetrable to water, and is not injured by the action of the weather, or heat of the sun, which hardens it.

Three parts of air-slacked lime, two of wood ashes, and one of fine sand, or sea coal ashes; sift these through a fine sieve, and add as much linseed oil as will bring it to a consistence for working with a painter's brush; great care must be taken to

mix it perfectly—two coats are necessary; the first rather thin, the second as thick as can conveniently be worked.

Painting wood before the sap is dry, hastens its decay.

SEA WEEDS.

[Selected.]

Sea weeds are used as a manure, and are also converted into kelp by burning in a kiln. Kelp consists chiefly of the fixed vegetable alkali, in a pretty caustic state. It is used in the manufacture of glass, soap, and allum, and in bleaching of cloth.

The three numerous genera of Fucus, Ulva, and Conferva, are capable of affording kelp; but the four following plants produce the most; viz. Sea Oak, (*Fucus vesiculosus*;) Bell Wrack, (*F. nodosus*;) Serrated Wrack, (*F. serratus*;) and Tangle, (*F. digitatus.*)

It is observed of these plants: 1. That they are always of a quicker growth upon shores exposed to a current, than in more quiet water. 2. That the weeds which grow in currents afford a larger proportion of kelp, than those which grow in dead bays; and 3. That the weeds which grow where there is much fresh water, neither yield so much kelp as where the water is perfectly salt, nor of so good a quality.

The cultivation of *fuci*, upon shores, becoming an object of some consequence, it has therefore been recommended to cover the gravelly, sandy, or sleechy shores, expecially near the mark of ebb, with loose stones, from 2 to 300 pounds weight, or upwards, and not more than two feet distant from each other.

A beach, treated in this manner, will in four years, yield as good a crop as the natural shore.

They are cut from the rocks in the month of May, June, and July: and should be dried as quickly as possible, and burnt as soon as they are ready for the kiln.

SELECTION OF CATTLE FOR BREEDING.

[Selected.]

Is there any room to doubt that the profits of our dairies may be greatly augmented by proper attention to the breed of milch

cows? There is some prejudice on this point. It is said, good keeping makes good cows; yet those who say it, see in their own cow yards, very frequently, a single cow, not bigger nor better fed than the others, give a double quantity of milk. It is very careless and stupid to go on rearing the calves from poor cows in preference to those from good cows: yet this is pretty generally done, because the excellent cows bring excellent fat calves for market. Their good or bad qualities are doubtless hereditary, as well as their colour and size—at least in a very considerable degree. Why should we scruple this any more than the improvement of the breed of horses, which we prize for their blood? The bull is to be chosen with no less care than the cow. The best cows for milk may be raised as certainly as horses for racing or for draught—and in a dairy country, the total neglect of this important care is shameful and unaccountable.

As connected with the last point, it is to be known, whether the method of feeding cattle at a stack is not wasteful of the fodder, of the manure, injurious to the grassward, and to the cattle, by pinching their growth in wet and cold weather? On the other hand, whether our common cow houses are not too warm and close.

The leading idea that has governed Mr. Bakewell, in all his exertions, is to procure that breed of cattle which in a given quantity of food will give the most profitable meat—that in which the proportion of the useful meat to the quantity of offal is the greatest; also, in which the proportion of the best to the inferior joints is the greatest.

Therefore a great head, dewlap, or horns, or an over thick hide, are rather offal than meat.

On this plan, the points to attend to in a beast are those where the valuable joints lie; the rump, the hip, the back, the ribs, and after these the flanks, that is to say, the backward upper quarters; but the belly, shoulders, neck, legs, and head should be light; for if a beast has a disposition to fatten or be heavy in these, it will be found a deduction from the most valuable points. It has been said, but improperly, that a barrel on four short sticks would represent the true form; but that shape swells at the top and bottom, whereas the back of a beast should be square,

straight and flat, or, if any rising, it should be from a disposition to fatten and swell about the rump and hip bones—and the belly should likewise be quite straight, for if it swells it shews weight in a bad point.

He judges whether a beast has the right disposition to fatten, *by feeling*. He had rather depend on feeling only, than on seeing without feeling. In sheep, the hand only can tell whether the back is flat and broad, and free from a ridge in the back bone. There is a great difference in the feeling of lean bullocks: The hip bone should be covered with something under the skin that feels oily and soft—the same along the back bone and on the ribs with a good flank. In beasts that will not thrive well, there is nothing of this softness to be perceived, but the hide is tight and hard. There is indeed sometimes in such a frothy looseness, unlike the mellow feel. It is hard to describe this in words, but the graziers understand and practise it perfectly. Mr BAKEWELL pays no regard to crossing the breed—his own success shews it of no consequence whatever.

SHEEP.

The same rules of judging are applicable both to sheep and cattle.

The points to examine in a sheep and the general form of his carcass are the same as in an ox. The fatness and breadth of back, a spreading barrel carcass, with *flat* bellies, and by no means curved and hanging—with such a disposition to fatten as is indicated in the bulls and cows. In such the fat goes into the meat, instead of making tallow. He would have the fat not run to tallow, and all the offal, as the head, pluck, hoofs and bones, very small—his own breed are remarkably so. He keeps in pickle a neck of his own mutton, which is four inches and an half thick with fat on the bone.

One of his sheep was killed, weighing 46lbs. a quarter; it cut six inches of fat between the tail and the loin, along the back three inches, and at the division of the quarters through the ribs, six inches and a quarter—yet his sheep are usually of a moderate size. It is the shape nnd disposition to fatten that makes them so heavy. Let the food be what it may, they will

eat less and fatten more than any other breeds of sheep. It is by these principles that Mr. Bakewell has gradually formed his breed by selections.

The kind of cattle that were most esteemed before Mr. Bakewell's day, were the large, long bodied, big boned, coarse, gummy, flat sided kind. This discerning breeder on the contrary introduced a small, clean boned, round, short carcased, kindly looking cattle, and inclined to be fat—and it is a fact, that these will both eat less food in proportion, and make themselves sooner fat than the others—they will in truth pay more for their meat than any other sort in a given time.

DYERS' WOAD.

DESCRIPTION AND MANNER OF CULTIVATION.

[Miller's Gardener's Dictionary.]

The common Woad, (*Isatis Tinctoria*,) is a biennial plant, with a fusiform, fibrous root. Stem upright, round, smooth, woody at bottom, branched at top. Root-leaves ovate lanceolate, on long foot-stalks, down which they run a little. Stem-leaves alternate, quite entire, embracing, smooth, from two to three inches long, and scarcely half an inch in breadth. These are sometimes very slightly toothletted ; and a few hairs are sometimes found both on the stem and leaves. Flowers small, terminating the stem and branches in a close raceme. Both corolla and calyx yellow ; petals notched at the end. Seed vessels on slender peduncles, hanging down. Chesnut coloured or dark brown and shining when ripe, of an oblong elliptic form, near half an inch long and two lines wide, compressed at top and on the sides into a sharp edge, swelling like a convex lens in the middle, with a straight longitudinal suture on each side, one celled, two valved, but hardly opening spontaneously : vales of spongy substance like cork, and boat-shaped.

Seed smooth, striated a little, two lines long, and three quarters of a line wide, yellow or brownish yellow when ripe ; it has only a single membranaceous coat. Embryo curved, yellowish. Cotyledons ovate, fleshy, plano-convex.

Mr. Miller thus describes the cultivated plant, which however differs little from the wild one except in luxuriance. The lower leaves are of an oblong oval figure, and pretty thick consistence, when growing in a proper soil; they are narrow at their base, but broad above, and end in obtuse roundish points; are entire on their edges, and of a lucid green. The stalks rise near four feet high, dividing into several branches, with arrow-shaped leaves sitting close; the ends of the branches are terminated by small yellow flowers, in very close clusters. The pods are shaped like a bird's tongue, half an inch long, and one eighth of an inch broad, turning black when ripe. It flowers in July, and the seeds ripen the beginning of September.

According to Linneus, Woad is a maritime plant. It is a native of several parts of Europe; it is found on the coasts of the Baltic and near the Ocean. It is also found by the way-sides in Switzerland.

A fine blue colour is obtained from Woad. It is also the basis of black and many other colours.

As the goodness of Woad consists in the size and fatness of the leaves, the only method to obtain this is to sow the seed upon ground at a proper season, and allow the plants proper room to grow, as also to keep them clear from weeds. The method practised by some of the most skilful kitchen gardeners in the culture of spinach, would be a great improvement to this plant, for some of them have improved the round-leaved spinach so much by culture, as to have the leaves more than six times the size they were formerly; and their fatness has been in the same proportion, upon the same land, which has been effected by thinning the plants when young, and keeping the ground constantly free from weeds.

A hazel loam, whose parts will easily separate, is the best soil for Woad. The ground should be ploughed and laid in narrow high ridges just before winter;—it should be ploughed again in the spring; a third time in June, and lastly toward the end of July or early in August. In the intervals between each ploughing, it will be necessary to harrow the soil, so that all weeds may be destroyed.

Woad is sown in England early in August, and generally broad-cast, though the drill husbandry is the most advanta-

geous. At the end of two or three weeks, the plants must be hoed, at the distance of at least six inches; after which they will require no further attention except a careful weeding in October, and particularly in the month of March.

The proper time for gathering the leaves is determined by their full growth, and the first change of colour at their points; they are cut with an edged tool, and collected into baskets by women and children. If the land be good three or four successive crops may be taken; but the two first are the finest. After the leaves are gathered they are submitted to the action of mills, similar to those employed for grinding oak bark; and in which they are reduced to a kind of pulp. The Woad is then laid in small heaps which are closely and smoothly pressed down. As often as the crust formed on the outside cracks or breaks it is again closed, in order to preserve the colouring matter. In this state it remains for a fortnight; at the expiration of which the heaps are broken up; the external part is worked into a mass, and the whole is formed into oval balls, either by the hand or by means of moulds; the balls are now exposed to the sun under shelter; when perfectly dry they are ready for sale. Such is the process which Woad undergoes before it becomes fit for dying *blue* colours. But Mr. Astrue is of opinion, that if this vegetable were cured in the same manner as indigo, it would produce a colour of equal lustre to that obtained from such an expensive drug. DAMBOURNEY directs to boil the fresh leaves of Woad with diluted bullock's blood, or more effectually with caustic soap-boiler's lye; in this simple manner a dark green decoction of a bluish shade will be obtained; and after clarifying the liquor, it will form a blue precipitate; which, dissolved in oil of vitriol, and properly diluted, imparts a beautiful colour to woollen cloth. Farther, even the leaves, in a state of fermentation, with pure water on adding a small portion of caustic alkaline lye, afford a fine blue sediment resembling the true indigo. [This useful article abounds in the western states, and also in Pennsylvania, according to the report of an experienced native of Britain, who is settled near the head of Ohio, in Washington County, Pennsylvania. It appears that the farina is much richer than that in England; and that instead of two crops, which are obtained in England, five are yielded in the United States.]

DYER'S MADDER DESCRIBED—MODE OF CULTIVATION IN HOLLAND.

[From Miller's Gardener's Dictionary.]

Dyer's madder, (*Rubia Tinctorum,*) has a perennial root, and an annual stalk. The root is composed of many long, thick, succulent fibres, almost as large as a man's little finger; these are joined at the top in a head, like the roots of asparagus, and strike very deep into the ground, being sometimes more than three feet in length. From the upper part, (or head of the root,) come out many side roots, which extend just under the surface of the ground to a great distance, whereby it propagates very fast; for these send up a great number of shoots, which, if carefully taken off in the spring, soon after they are above ground, become so many plants. These roots are of a dark colour on their outside, somewhat transparent, and have a yellowish red pith in the middle, which is tough, and of a bitterish taste; from the root arise many large, four-cornered, jointed stalks, which in good land will grow five or six feet long, and, if supported, sometimes seven or eight; they are armed with short herbaceous prickles, and at each joint are placed five or six spear-shaped leaves, about three inches long, and near one broad in the middle, drawing to a point at each end; their upper surfaces are smooth, but their mid ribs on the under side are armed with rough herbaceous spines; the leaves sit close to the branches in whorls. From the joints of the stalk come out the branches, which sustain the flowers; they are placed by pairs opposite, each pair crossing the other; these have a few small leaves towards the bottom, which are by threes, and upward by pairs opposite; the branches are terminated by loose branching spikes of yellow flowers, which are cut into four segments resembling stars. These appear in June.

[Leaves four, five, or six. Flowers four, five, or six cleft. Native of the south of Europe, the Levant, and Africa.]

It is well known that madder is so essential to dyers and calico-printers, that neither business can be carried on without

it. The consumption of it is so great in England, that, upon a moderate computation, more than one hundred and eighty thousand pounds sterling is annually paid for what is imported from Holland.

Madder requires a loamy, substantial soil, not too stiff and heavy, nor over light and sandy. The land which is designed for madder, if strong and heavy, is ploughed twice in autumn, that the frost in winter may mellow it and break the clods ; then it is ploughed again in the spring, just before the time of planting. But if the ground is light, twice ploughing in the spring is sufficient. The land is then divided into beds about three feet broad, with a space between, for the convenience of weeding with ease. Madder is raised from the slip, and very rarely from the seed. The time for planting is about the latter end of April, when the young shoots are taken off from the mother plant, from the sides of the root, (they are at this time about two inches above ground,) with as much root as possible ; and planted in rows about one foot asunder, and commonly four in a row.

The first year it is customary to plant cabbages or dwarf kidney beans in the furrows between the beds, but this practice has been found by experience injurious to the growth of the plant ; care should be taken to keep the ground entirely free from weeds.

In September or October when the young madder is cleaned for the last time that season, the stalks of the plants are carefully spread down over the beds, without cutting any part off, and in the month of November covered over with three or four inches of earth.

In the spring of the second year, when the young shoots begin to come out, the earth on the top of the beds should be scuffled over and raked to destroy the young weeds, and make the surface smooth and mellow, that the shoots may push out with the more ease.

The second summer, there must be the same care taken to keep the madder clean as in the first, and nothing should be planted or suffered to grow amongst it.

At the last time of cleaning the ground in September or October the green stalks are again spread down upon the beds,

and in November they are again covered with earth in the same manner as the first year.

By this method of culture one can see how necessary it is to plant the madder in beds, for thereby it is much easier covered with the earth of the furrows; and the earth of the beds is every time raised, whereby the madder roots will be greatly lengthened, and the young shoots will have longer necks, and by being thus deeply earthed, will put out more fibres, and have much better roots, without which they will not grow; and it is of equal use to the mother plants; for by this method the roots will be longer; and in this consists the goodness and beauty of the madder, for those which have only a few main roots, are not so much esteemed as those which are furnished with side roots.

The madder roots are seldom dug up the second year, but generally after they have grown three summers, therefore the culture of the third year is the same as in the second, during the spring and summer.

The madder roots are usually dug up in Holland about the first of September, or when the stalks begin to decay in the third year. The more bitter the taste of the roots when taken out of the ground, before they are brought to the stove, the less they will loose of their weight in drying, and the better they are afterwards for use.

There have been some ignorant persons, who have advised the cutting off the stalks in summer, in order to strengthen the roots; but whoever practises this, will find to their cost the absurdity of this method; for I have fully tried this many years ago, and have always found that every other root upon which this was practised, was at least a third part smaller than the intermediate roots, whose stalks were left entire. The first occasion of my making this experiment was because the plants had been set too near each other, and the season proving moist had increased the number and strength of the shoots, so that they were so thick as that many of them began to rot; to prevent which I cut off the shoots of every other plant, to give room for spreading the others thinner, but soon after this was done the plants produced a greater number of shoots than before, but they were weaker, and the effect it had upon the roots

was as before related; since which time I have frequently repeated the experiment upon a few roots, and have always found the effect the same.

When the season for digging up the madder root is come, it should be done in the following manner, viz. a deep trench should be dug out at one side of the ground next to the first row of madder, to make a sufficient opening to receive the earth, which must be laid therein in digging up the row of roots, so that it should be at least two feet broad, and two spits and two shovellings deep, and should be made as close as possible to the roots, being careful not to break or cut the roots in doing it; then the row of roots must be carefully dug up, turning the earth into the trench before-mentioned. In doing this there should be persons to pick out the small fibres remaining below, after the principal roots are taken up; in order to get the roots as clean as possible, the whole spot of ground should be dug of the same depth as the first trench, and the pickers must follow the diggers to get them all out to the bottom. The digging of the land to this depth is a fine preparation for any succeeding crop.

After the roots are taken up, the sooner they are carried to the place of drying, the finer will be their colour; for if they lie in heaps they are apt to heat, which will discolour them; or if rain should happen to wet them much it will have the same effect, therefore no more roots shall be taken up than can be carried under shelter the same day.

The first place in which the roots are laid to dry must be open on the sides to admit the air, but covered on the top to keep out the wet. If a building is to be erected new, such as the tanners have for drying their skins will be as proper as any, for these have weather boards from top to bottom at equal distances to keep out the driving rain, but the spaces between being open admit the air freely; and if instead of plank floors or stages above each other, they are laid with hurdles or basket-work, upon which the roots are laid to dry, the air will have freer passage to the under side of the roots, which will dry them more equally. In this place they may remain four or five days, by which time the earth which adhered to the roots will be so dry as easily to rub off, which should be done before the

roots are removed to the cold stove; for the slower the roots are dried, the less they will shrink, and the better will be the colour of the madder; and the cleaner the roots are from earth, the better the commodity will be for use when prepared.

After the roots have lain a sufficient time in this place, they should be removed into another building, called the cold stove; in which there should be conveniences of flues passing through different parts of the floor, and the side walls; in this the roots should be laid thin upon the floors, and turned from time to time as they dry, taking those roots away which are nearest to the flues which convey the greatest heat, placing them in a cooler part of the room, and removing such of them as had been in that situation to the warmer, from whence the others are taken. Constant care in this particular will be of great service to the quality of the madder; for when this is properly conducted, the roots will be more equally dried, and the commodity, when manufactured, will be much fairer and better for use.

When the outside of the roots has been sufficiently dried in this cold stove, they should be removed to the threshing floor, which may be the same as a common barn where corn is threshed. The roots should then be threshed, to beat off their outside coverings; this is the part which is prepared separately from the inner part of the root, and is called *mull*, which is sold at a very low price, being the worst sort of madder, so cannot be used where the beauty or permanency of the colours is regarded. These husks are separated from the roots, and pounded by themselves, and afterwards packed up in separate casks.

After the mull is separated, the roots must be removed to a warmer stove, and dried with care, for if the heat is too great they will dry too fast, whereby they will lose much in weight, and the colour of the madder will not be near so bright; to avoid which the roots should be frequently turned, and the fires properly regulated.

When the roots are properly dried in this stove they must be carried to the pounding house, where they must be reduced to powder.

In Holland when it is pounded about a third part, it is sifted, and the powder, which consists of the thinest and smallest roots, and the remainder of the outside husks, and some dirt which could not be separated by drying and threshing, is placed in a separate cask, and is of inferior quality to the powder from the second pounding, or what is yielded by the remainder of the roots, and which bears a higher price.

LICE INFESTING YOUNG ORCHARDS IN THE DISTRICT OF MAINE—MODE OF DESTROYING THEM.

[Letter from E. Perley, Esq. formerly published by the Trustees.]

This insect, called *lice*, is in form like half a kernel of rye, (but not more than one twentieth part so large,) with the flat side sticking to the smooth bark of the tree. They resemble blisters; and are near the colour of the bark of the tree. These blisters contain from ten to thirty nits or eggs each, in form like a snake's egg; which, in a common season, begin to hatch about the 25th of May, and finish about the 10th of June. These nits produce a white animalcule, resembling a louse, so small, they are hardly perceptible by the naked eye; which, immediately after they are hatched, open a passage at the *end* of the blister, and crawl out on the bark of the tree; and there remain, with but little motion, about ten days; when they stick themselves fast to the bark of the tree, and die. From this little carcass arises a small speck of BLUE MOULD, which is most plain to be seen between the 10th and 20th of June, and continues about fifteen days; and then gradually wears off, until the old carcass appears, which by this time is formed into a new blister, and contains the spawns or nits before mentioned.

These blisters prevent the circulation of sap; and prove as fatal to the tree as the canker worm.

In order to remedy the difficulty, I have made many experiments within a few years; but long to no good effect, not knowing then the particular season when these animalcules could be most easily destroyed. This, however, I have lately found to be between the time they hatch, and that when the

mould leaves them.* The application that I have found most effectual is, washing the tree with lye, or brine. Lime also, mixed with lye to the consistency of whitewash, may be useful. And although the *small* branches cannot be cleansed in this manner without much difficulty, still if the body of the tree and the branches near the body are kept clean, until there comes a *rough* bark, I think the lice will not kill *the tree.*

Some people have recommended the application of *train oil* to the tree, which indeed is a powerful antidote against lice; but being of a glutinous quality, is very detrimental to the tree. *Inoculation* has been proposed; which I think will have no effect at all on the lice; for I perceive they hatch in May, on branches that were pruned off the tree in March, and the sap entirely extinguished.

These lice are natural in the *uncultivated* forest, on what is called moose-wood and other bushes.

Much care should be taken on their first appearing in an orchard or nursery; as the cutting down and destroying a few young trees is of no importance, compared with the difficulty of having an orchard overrun with them, &c.

P. S. The brine or pickle, with which the tree is to be washed, should not be such as has had meat salted in it; but let one quart of common salt be dissolved in two gallons of clean water.

MEMOIR ON THE MANAGEMENT OF BEES.

BY REV. THOMAS NOYES OF NEEDHAM.

THE trustees have received and read with interest and pleasure the observations of Mr. Noyes. They have examined attentively his model for hives, and on the whole are inclined to give it the preference to any which they have seen described, provided

* It appears from this account, by Mr. Perley, that these appearances can, in general, only occur between May 25 and July 5.

they shall turn out to be as useful in the hands of other persons, as in those of Mr. Noyes, who is undoubtedly a very observing and skilful manager of bees.

The management of bees is an important branch of agriculture, and has so been considered in all ages. Few branches yield so much profit and so innocent a luxury at so little expense of money or time.

We have taken the liberty to abbreviate Mr. Noyes's essay, because, important as the subject is, we had not room in the present Number for the whole, and we thought it better to abbreviate than to divide it; as in the latter case, many might see one part who might never read the other. We understood also that he very modestly and kindly permitted us to take the freedom to shorten it if we should find it necessary.

It became the more important to do it, inasmuch as it was absolutely necessary that we should precede it by some remarks. If, as we are informed, and indeed the memoir itself bears internal evidence of it, the observations of Mr. Noyes were solely the result of his own attention and experience, unassisted by the great lights which have been thrown upon this subject by the German, French, and English writers, he is certainly a very indefatigable and ingenious man, and we cannot but regret that he had not enjoyed the benefit of these deep researches of European naturalists on this curious insect; as it is probable he might have either confirmed by new discoveries and remarks their histories and theories, or perhaps have thrown some new light upon the subject of the natural history of the Bee. It would not however have been proper for this Society to have published the remarks of Mr. Noyes without adverting to the very extensive researches lately made on this subject in Europe.

It might have implied an indisposition to give to the Europeans the credit due to them, or such a neglect on our part might have been added to the many censurable cases, in which some of our citizens have been ready to appropriate to themselves the labors of Europeans. It assuredly does not in any degree diminish Mr. Noyes's merit, (who most certainly never has had the means of obtaining this information,) to say that Europeans have preceded him in the same field of useful inquiry;

nor is it any sort of discredit to him that he has not read these works, because it is well known, that the stipends of our excellent clergy in country villages will not permit them to lay out 200 dollars for Dobson or Rees' Encyclopedia, or half that sum for the Abbé Rosier's Cours d'Agriculture, from which our knowledge on this subject is derived.

Mr. Noyes has not gone into the abstruser parts of the natural history of this insect, such as the sexes, the mode of generation, the anatomical conformation of the insect. These subjects have been fully discussed by Swaunnerdam, Reaumur, Scheiac, and Bonnet. It is a curious and interesting topic and is most clearly and satisfactorily discussed in Rosier's abovementioned work, title, "Abeilles."

As so few of our fellow citizens in the country have an opportunity of seeing these expensive works, we think we shall abridge this article in our next number, which will render it unnecessary to make any other remarks before we introduce Mr. Noyes to our readers, except that following Virgil, Mr. Noyes seems to consider the monarch of the bees *a male*. There is no point more clearly settled than that the monarch is a female, and the mother of the whole new swarm or progeny. There is but one female suffered to remain in a hive. We shall not here enter into many other curious facts as to the mode of treatment of her and of supplying her place when she dies or is taken away. We shall leave that till we abridge the article above alluded to.

Wildman, an English cultivator, and half a score of French gentlemen, have exercised their ingenuity in inventing different forms of hives, all having the same object, the procuring of a part of the honey without adopting the wasteful, and unnecessary, and painful expedient of destroying the bees.

Mr. Noyes had the same object in view. It will be seen, we think, when we shall give an account of the other sorts of hives, proposed by the European cultivators, that Mr. Noyes' are entitled to a preference to any which have been described in the work above mentioned.

We now proceed to an abridgment of Mr. Noyes's memoir.

ON THE MANAGEMENT OF BEES.

Every one in a republic is bound to render himself useful in some way to society; either by his industry, instructions, or example; or by all these united. Influenced by a desire of being useful, I am induced to make the following communication to the honorable *Trustees of the Massachusetts Society for promoting Agriculture;* but how far I shall succeed in advancing the public or agricultural interest, I shall leave for you, gentlemen, to determine.

From early life my attention has been attracted by that well known insect, the bee. Influenced by a principle of humanity and interest, I have, for several years past, been led to make some experiments in the management of these industrious and profitable insects, with a view to find an easy and safe *substitute* for the barbarous practice of exterminating them, in order to enjoy the fruits of their industry.

I have now the satisfaction to state from actual experiment, a simple and safe process, which I have adopted, of making my bees pay an annual tribute, without waging an exterminating war upon them. In order to effect this, I find it necessary to construct my hives very differently from what has been the general plan of their formation. I have substituted boxes, and give each swarm two, three, or four, boxes, as I find their situation requires. Their introduction from one box to another is easy, and the removal of either of the boxes is safe and practicable, at any season of the year, or in the middle of the day, when they are the most active. With very little injury to them, I can take their hive into as many parts as it consists of boxes; put it together in the same, or different order; take which box I please; avail myself of its contents, without injuring the bees; give them another box, or return the same empty; place it at the top, bottom, or centre, at pleasure. And in this way, make them more industrious, by affording them constant employment, and completely remedy their necessity for idleness, which is sometimes the case, when they have filled their hives, and have no where to bestow their goods.

To prove the practicability of what I have suggested, I shall be particular in describing the dimensions and structure of the

hive, which I use ; the method of introducing the bees into it ; the process of increasing or diminishing the number of boxes, without having a host of assailants around me ; and some general observations relative to the attention they require.

The boxes, which I use, are constructed in the following manner. I take a clean inch board, six inches wide, and saw it into pieces fifteen inches long. Four of these pieces, when put together at right angles, will form the four sides of a box, whose dimension within will be fourteen inches square and six inches deep. At the centre of the bottom of that side which I design for the front, I make, for a door or passage for the bees, an opening, one and an half inch long, and one third of an inch deep. Then cover the top and bottom with pieces of boards, whose thickness does not exceed one sixth or one eighth of an inch. These covers ought to project in the front about one inch to accommodate the bees with a place or stage, on which they may alight and rest. They serve as partitions between the boxes · and the lower cover ought to be confined with small screws, that it may be easily removed, when the honey is to be taken from the box. The door or passage for the bees being already made, I proceed to open a large hole for the purpose of introducing the bees into the box, and as a communication from one box to another. For this purpose I cut two holes, between three and four inches square, through the centre of the two thin covers. Having all my boxes made in the same form, and size ; with holes corresponding when placed one above another ; it is immaterial which is used for the top, bottom, or centre one, as in every position there will be a correspondence and uniformity.

The top box is always to be covered with a board not less in its dimensions, than the top surface of the hive ; with a weight upon it to keep it in its place and prevent its warping. By having these partitions thin, the bees in each box come nearer in contact ; and by having the boxes so completely closed, united only by a communication in the centre, they can be separated by a very little brakage of the comb and honey, as all the cells are parallel with the surface of the boxes ; and in separating them, they are cut horizontally and not transversely.

When my bees swarm, and having alighted on some branch of

a tree, and become quiet, I am generally ready to receive them; but am careful to introduce them into a clean box, which is prepared by faithfully rubbing the inside with the leaves of sweet balm, walnut, hazelnut, or balm of gilead; moistened in a strong brine, made by the solution of clean salt. Having prepared two boxes in this way for their reception, I place a clean table in the shade; and with a knife or saw cut off the branch on which the bees have alighted, and place them on the table, and having united two boxes, place the hole in the lower box directly over the centre of the bees; with care that it does not press so hard as to injure them. They generally indicate by their movement that they know what is designed, and take possession of their new habitation. If they do not immediately retire to their provided tenement, I take a small branch of a tree that is clothed with leaves, and gently thrust it in among them, and they will leave the branch of which they first took possession, and retreat into the box for protection without offering to resent any want of civility towards them. I gradually lower the box as they retire into it, till it comes in contact with the table, and leaves them no communication to pass out of the box, but the door.

If my bees light on the trunk of a tree, or on a branch that is too unwieldy to move, or too valuable to be cut, I set a table under them. If they are high, I suspend a table between too ladders, put my boxes on it, elevated a little so as to give them a passage between the lower box and the table; and with a clean wing or something that is soft, brush the bees in direction of the table, and they will not fail to take possession of the tenement provided for their reception. Proceeding in this way, I meet with no difficulty in introducing my bees into my new constructed hives. The bees ought to be removed as soon as they are quiet, to the place where they are to remain, before they go abroad, or at evening when all are in their habitation; or else many of them will be lost, and never again join the swarm. In hiving and moving the bees, particular care ought to be taken not to irritate, or injure them by wounding or killing them.

Bees require particular attention during the season in which they usually swarm; and at every season, they ought to be secured from the wet; and kept remote from swine, geese, and

fowls, that no disagreeable stench arise from any thing among them. Their house ought to be so constructed and situated, that the rising sun may animate them to early industry, and at the same time shield them from his meridian beams, during the warmest of the season, for too much heat is unfriendly to their comfort and activity. When the season is nearly past for collecting honey, the doors of their hive must be contracted, to enable them better to defend themselves against invaders. When the resources of nature fail, they sometimes invade other hives with a view to make conquest; but in doing this, they do not unfrequently attack a late swarm, that has not a sufficient store of provision to preserve them through the winter. In this case their conquest seems to be humane, for they receive the vanquished into their own dominions, and incorporate them with all the privileges of their own subjects.

By contracting the aperture of the hive in the autumn, the bees can not only easier defend their territories against their enemies, but their hive will be rendered more comfortable for winter. The extremes, cold and heat, are unfavourable to the prosperity of bees.* Before cold weather commences enclose the hives on every side, except the front, with straw to defend them from the snow and piercing cold. In the month of February when the weather is moderate, the bees will leave their hive, and many of them light on the snow, and unless straw be spread in front of the hive on the snow, many of them will never rise again. They will soon chill and die, unless they find something, by which they may crawl from the snow, and so rise and return to the hive. It will be necessary to spread straw every new snow, or else their numbers will be greatly diminished by chilling and dying on the snow in front of the hive.

The process of diminishing or increasing the number of boxes, is both simple, easy and safe. In collecting their tribute, or enlarging their habitation, two things I carefully observe; one is not to kill or wound them; the other is to put it out of their power to injure me. For this purpose, if it be in the morning before they have left their habitation, I close the

* "nam frigore mella
Cogit hiems, eademque calor liquefacta remittit:
Utraque vis apibus pariter metuenda:" Virgil Georgica lib. iv.

door upon them, and confine them at home. If it be in the middle of the day, when they are active, I approach them with the smoke, that arises from burning leather, which has the best effect. This will make them retreat into their hive at any time, or leave the branch or trunk of a tree when hiving them, should they attempt to regain the place they, at first, occupied, after being brushed off. Besides, by this act of fumigation another important advantage results. It will disarm them of all resentment, and render them harmless. Whenever they assume a hostile attitude, in hiving them, I first fumigate them, and they are immediately transformed into peaceful subjects, and my reception is friendly. But to return to the process of collecting their tribute.

I have already observed that the bees are confined in the hive. Supposing the hive to consist of three boxes, and I wish to avail myself of the honey in the middle box. I approach them with four sheets of tin, or slides made of a board one eighth of an inch thick, twelve inches wide, and eighteen inches long—made sharp at one end, and the other secured by a narrow piece of board to prevent its warping and as a handle to the slide. I raise the upper box in front a little, and insert one of the slides, which cuts off all communication between the two upper boxes; then insert another slide directly under the first. This being done, take the top box off, lifting it by the upper slide, which will prevent the bees escaping out of the top box, and the other slide remaining on the top of the second will confine them in the other boxes. I then insert two more slides between the two remaining boxes, in the same manner, and the hive is prepared to be separated into three parts. I then raise the middle box by lifting it by the slide immediately under it, carry it a little distance from the others, place it on a little carriage made with four low wheels or trundles, simply connecting the two axles by two side pieces, of such dimensions as to receive the box and confine it, when the carriage is in motion. Then put the two remaining boxes together, insert an empty one in the middle or on the top; remove the slides, let the boxes come in contact; open the doors and give them their liberty. Remove the slides from the box on the carriage, stand at a distance and draw it by a cord; and the gentle motion will

not break the comb, but will cause the bees to come out and return to the hive, for they will not long pursue the box that is continually receding from them. In this way, I have taken a box of honey in the middle of the day without injury, when the bees are the most active, and most susceptible of resentment. The process of removing the top or bottom box, requires but two slides, and is much more simple, and does not render it necessary to cut off the communication between the two remaining boxes.

In putting in the slides, the boxes must not be raised so high as to have the bees escape; and in selecting a box, if the one that contains the monarch of the kingdom be taken, the bees will not so willingly relinquish their habitation, unless he take his departure from it. They will appear to be unwilling to leave him without some attendants. Experience has convinced me of this. I removed a box last July, from the hive which was filled with the choicest honey; but on removing the honey from the box, I found at one corner of it about forty or fifty bees collected together, and they appeared unwilling to separate, yet as harmless as though they possessed no weapon of defence. I suspected that the monarch was a prisoner—With a spoon I took out the bees and soon found evidence to confirm my supposition. The monarchs of these well regulated kingdoms, I had, in several instances before, been favoured with opportunities to inspect. I found that he was much longer than the other bees. His wings were of a lighter hue, and the rest of him much darker colour. His motions were nimble, and he displayed an activity not common to his subjects. After having inspected him to my own satisfaction, and exhibited him to the view of my family, I returned him safe to his own dominions. In doing this I placed him several inches from the door of the hive to ascertain whether any particular attention would be paid their sovereign on his return. To my astonishment, I beheld several bees crawl to him, and with evident marks of joy and congratulation, attended him to the hive.

I shall now attempt a numerical statement of the advantages, which result from the method proposed of managing these industrious insects, superior to that which is generally practised.

First. It contributes to their preservation. Bees are prof-

itable insects. They richly reward us for all our attention to them, and whatever they collect that is useful and pleasant, adds so much to the real wealth of the community; for the sweets they extract would evaporate in the air, or decline with the fading blossoms. Surely then, we have motives, arising from interest to spare and protect the industrious bee, whose honey is not only grateful to the taste, pleasant and wholesome for food, but highly valuable in a medicinal view; and whose wax, when extracted from the comb, is valuable for light, is almost indispensable in some arts, and is highly beneficial in medicine.*

Secondly. Another advantage arising from my method of managing bees, is, that you can draw from the hive what is more than necessary to supply them during the winter. Instead of leaving them honey to remain in their cells year after year in a candied state, you may take *annually* what you deem superfluous. Besides if you find there is a deficiency in some of your hives, and you are apprehensive their stock of provision will not supply them through the season, in which they cannot find resources abroad, you may give them a box of honey from a hive that can spare it; and, in this way, make up the deficiency of one hive from the redundance of another.

Thirdly. A small swarm of bees put into a larger hive than they can fill, appear to be discouraged, and will not be so industrious, as they would be, were they put into a single box, and then another added, when their situation should require it.

Bees put into a larger hive than they can fill in the season, will not keep so warm in the winter; and should they fall down when the weather is cold, which is often the case, they would be likely to chill and become inactive, and so be unable to re-

* The generality of mankind appear not to be sensible how much they are indebted to this insect for many of their comforts and luxuries, in the ample supply of the various kinds of fruit to regale them. I believe it is well ascertained, that unless the bee or other insects visited the flowers, the whole class of vines, fruit trees, and many culinary plants would be unproductive. There evidently appears to be two kinds of blossoms, which may be distinguished by the terms, male and female. Insects, by visiting both the male and female flowers, convey the ferina, or subtle particles to the stigma, which impregnates the flower, and thus it is rendered fruitful.

gain the place they left. The comb not extending to the bottom of the hive would not afford them a conductor to reascend; they would be under the necessity of climbing by the surface of the hive. It is a fact that a hive of bees, thus situated, generally lose double the number of bees, during the winter, that a swarm does, whose comb affords them a conductor to reascend when they meet with this misfortune. Besides, the bees have further to travel after entering the hive to reach the repository of their treasures, for they carefully avoid that confusion which flying would create in the hive. Neither can the bees work to so good advantage in a large hive, as they can in one that is smaller. I find from several years' inspecting them, through glass windows, and the hole at the top of the upper box, that they always keep in the hive bees enough to cover the surface of their work, in order to keep their wax warm enough to mould it into their sexangular cells; besides a number of bees are generally employed as a chain for the others to ascend and descend. In a large hive, the surface of their work is more extensive, than it would be in a small one. The consequence is, more bees must be kept at home, and a less number spared to collect the sweet vegetable juice, or other necessary materials to enrich and adorn their hive. Neither can the bees so effectually defend themselves against the attacks of lawless invaders, when their residence is so remote from the entrance of their camp.

Fourthly. Honey deposited in boxes is not so liable to melt, waste, and destroy the lives of no inconsiderable proportion of the bees, as that which is laid up in large hives. The comb in large hives is suspended from the top, and forms a contact by the sides, and does not rest on the bottom, even when the bees have filled the hive as full as they ever do. They leave room to pass under the comb. Long and wide pieces of comb filled with honey, supporting many bees, suspended, when the weather is warm, become tender, separate and fall. The position of the comb being changed, the honey attenuated by heat, the sexangular cells discharge the sweet, glutinous liquor, and the bees, chained in the rich melliferous flood, are borne away in death by the materials they collected to preserve life. Whereas, honey deposited in boxes seems not to be subject to this misfortune.

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The comb is constructed in flakes, supported at the top, sides, and bottom generally, except the lower box, or the first they occupy, by short legs or braces, in order that the bees may encircle it on every side; and the pieces being small, there is not that pressure or stress of weight; it retains its position, and consequently the honey does not burst from the comb when the weather is warm.

Fifthly. Anther advantage resulting from having honey deposited in boxes, is that it may be taken out of them, without breaking the honey in any considerable degree. I took from a box in the month of July last thirty pounds of honey-comb, and several pieces, from one to four pounds each, without uncapping one cell. The honey was transparent and completely closed, nor was there a single cell in the whole box, but what was filled with the delicious fluid. It was superior to any that I ever saw taken from large hives; and if kept cool, to all probability, it might be preserved months or years unbroken in the comb. Besides, the method, which I have proposed, affords an opportunity of taking honey before the bees collect any from the flowers of buck-wheat, which honey is far inferior in flavour and delicacy, to that which is collected earlier in the season.*

Sixthly. The usual time to take up bees is in the autumn, but I do not confine myself to that season. My method of managing bees will admit of taking honey from them any time when they have it to spare; but in selecting a box, care must be taken to avoid that which contains the young bees. The object of the new colony is to add to their strength by increasing their numbers; consequently their early attention is directed to provide cells to deposit their eggs. The lower box, which they first enter, becomes the place of their residence, till they have filled it with comb and young bees, if it be an early swarm. The honey is to be sought in the second box, of which they gradually take possession. In filling the second box they begin at the communication between the two boxes, and raise

* Honey, collected from buck-wheat flowers, will do to preserve the bees, but it is several shades darker in its colour, less sweet in its nature, possessing something peculiar in its taste that is unpleasant, and emitting an effluvium which excites unpleasant sensations; and thus affording us evidence by three senses, what proportion of honey in the hive was collected after the bees had access to the flowers of buck-wheat.

their comb in the form of a frustrum or segment of a globe, and proceed in this way till they have raised it to form a contact with the cover.

Seventhly. The method of keeping bees in boxes that may be separated at pleasure, affords an opportunity of changing the comb in the hive before it becomes dark coloured and apparently rusty, and an unsuitable receptacle for that sweet, delicate, and nutritious fluid, which was the emblem of plenty in ancient Canaan. The purest honey deposited in such comb, loses its transparency and delicate flavour, and partakes, in no inconsiderable degree, of the colour of the comb.

Eighthly. This method of constructing bee-hives affords an opportunity of inspecting them, watching their various movements, and witnessing the progress they make in filling their hive. For this purpose the bees must first occupy the bottom box; and then by lifting up, or removing the top cover, you may, through the hole on the top, see them without disconcerting them until they have nearly filled the upper box, unless you breathe upon them; in this case they will soon let you know that you are an unwelcome visitor. I have inspected them in this way, and through glass windows inserted in their hives, for several years past; and I have beheld with astonishment their industry, economy, singular instinct and ingenuity.

Ninthly. By accommodating my bees with several apartments, I have it in my power to regulate their swarming. If bees are amply accommodated, they will not swarm; but it being an object to make them swarm, I therefore in the autumn reduce the number of their boxes, and leave them generally but two, which, if well filled, will amply supply them with sustenance through the winter.

I do not at first give an early swarm more than two boxes; for they will often send forth a young colony; and when they have done this, add another box, or in a short time take from them the one they have filled, and give them one that is empty. Thus, this method of managing bees will contribute to increase the number of swarms, and eventually make them more profitable; for experience evinces that multiplying the number of swarms makes them more industrious and productive.

To convince you that I have not, in this communication,

been amusing you with plausible theory, but have given you the result of actual experiment, I present you, in miniature, a model of my boxes, with the humane apparatus of obtaining the fruits of their industry, without striking a peaceable and industrious community out of existence.

This communication, with due respect, is submitted to your disposal; and should the writer, by a more humane management of these diligent and profitable insects, or in any other way, contribute to the preservation of their lives and real prosperity, and so add to the resources of his country, he will be well satisfied in the reflection.

THOMAS NOYES.

Needham, March 24th, 1814.

APPENDIX.

THE honey bee is an insect of singular excellence, worthy of claiming the attention, not only of naturalists, but of the public at large. Whether this insect is a native of America is a question, respecting which there is some variety of opinion. Mr. Jefferson in his Notes on Virginia has endeavoured to prove the negative, while Dr. Belknap has more satisfactorily established the affirmative. It may not be uninteresting to the friends of literature to see briefly stated the arguments adduced by these two ingenious and respectable writers in favour of their several positions.

In the American Edition of Mr. Jefferson's Notes in the 79th page, he has asserted, that "the honey bee is not a native of our continent. The Indians concur with us in the tradition that it was brought from Europe, but when, and by whom, we know not. The bees have generally extended themselves into the country, a little in advance of the white settlers. The Indians therefore call them the white man's fly; and consider their approach as indicating the approach of the settlement of the whites." Mr. Jefferson allows that "in Brasil there is a species of honey bee, without a sting, but that is very different from the one we have, which perfectly resembles that of Europe."

Dr. Belknap admits these facts adduced by Mr. Jefferson

as true, but says, "they will not warrant the conclusion that the honey bee, meaning the one resembling that of Europe, is not a native of our continent."

The learned Doctor, in his dissertation on the question, to establish the position that the honey bee is a native of America, adduces the circumstance of Columbus writing a short narrative of his discovery on parchment, which he enclosed in a *cake of wax*, that he obtained from the island Hispaniola, (when his critical situation rendered it doubtful, whether he would be able to reach Europe and convey the happy intelligence, the discovery of the new world,) and put it into a tight cask, and committed it to the mercy of the wind and waves, cherishing a hope that it would be driven on shore where it might be found, or taken up at sea, so that the discovery he had made might not be lost to the European world.

"The indefatigable Purchas," says Dr. Belknap, "gives us an account of the revenues of the empire of Mexico, before the arrival of the Spaniards, as described in its annals; which are pictures drawn on cotton cloth. Among other articles he exhibits the figures of covered pots, with two handles, which were said to be pots of bee honey. Of these pots two hundred are depictured in one tribute-roll, and one hundred in several others."

"This account is confirmed by a late history of Mexico, written by the Abbé Clavigero, a native of Vera Cruz, who from a residence of thirty six years in Mexico, and a minute inquiry into the natural history and antiquities of his country, must be supposed to be well informed, and competent to give a just account. He tells us that a part of every useful production of nature or art was paid in tribute to the kings of Mexico; and among other articles of revenue he reckons six hundred cups of honey paid annually by the inhabitants of the southern parts of the empire. He also says, that though they extracted a great quantity of wax from the honey comb; they either did not know how, or were not at the pains to make lights of it."

"In his enumeration of the insects of Mexico, he reckons six different kinds of bees which make honey, four of which have no stings, and of the other two, which have stings, one agrees with the common bee of Europe, not only in size, shape,

and colour, but also in its dispositions and manners, and in the quality of its honey and wax."

"In the account given by Purchas, of the travels of Ferdinando de Soto, in Florida, it is observed, when he came to Chiaha, which is now a part of Georgia, he found among the provisions of the natives a pot full of honey of bees. This was A. D. 1540, when there were no Europeans settled on the continent of America, but in Mexico and Peru."

"From these authorities it is evident that honey bees were known in Mexico and the islands, before the arrival of the Europeans; and that they had extended as far north as Florida, a country so denominated from the numberless flowers which grow there in wild luxuriance, and afford a plenty of food for this useful tribe of insects. The inference is that bees were not imported by the Spaniards." Besides it is evident that the report of "honey and wax being found in the islands, in Mexico, and in Florida, had reached Europe, and had been published there long before any emigrations were made to the northward." From the above authority, aided by other evidence, the Doctor infers, "that the honey bee is a native of America, and its productions were found by the first European visitors, as far northward as Florida and Georgia."

If it be an established fact, that bees were in the southern states prior to any European settlements in North America, it is natural to suppose, that they would extend to the northern states. That some were brought from Europe into New England is admitted upon the authority of "Josselyn, who visited these northern states in 1638, and afterwards in 1663, and wrote an account of his voyages with some sketches of natural history, in 1673. He speaks of the honey bee in these words; "the honey bees are carried over by the English, and thrive there exceedingly." If bees were found in the southern states, and some imported into New England, it remains a question that cannot be solved, whether our bees are natives, or brought from Europe, or a mixture of both. Concluding that their appearance is an indication of cultivated land, this by no means establishes the position, "that bees are not natives of this continent;" for we may readily suppose they would flourish much better

where the land is improved, for there flowers grow in greater variety and abundance, than in an uncultivated wilderness.

Some entertain the idea that bees have degenerated, and do not flourish as they did at an earlier period of our country. It is a fact that a new settled country affords them more flowers, than a more ancient settlement; but can we not assign a satisfactory reason for such an effect? This may be accounted for in a considerable degree, on the principle, that they are treated with neglect.

Many persons pretend to keep them without any shelter, and leave them uncovered and exposed to the storms, through the year without contracting the door of the hive, to render their situation more comfortable in cold weather. Nor do they secure them against the depredations of the mice, which take shelter in their dominions, during the winter, when the bees are less active, and consequently more easily injured. In this way their comb is broken and consumed, their honey wasted, the bees discouraged and destroyed. The bees, which I possess, have received more attention; and I can trace back their ancestry through two families, between eighty and ninety years, and I presume there are no visible marks of degeneracy. Let those, who are entrusted with the care of these models of industry, follow the prescriptions contained in the preceding treatise, and they will have the satisfaction of seeing their bees flourish, become profitable, and annually contribute to adorn and enrich their tables with a wholesome and pleasant substance, fill their cup with a generous wine,* and add greatly to the resources of their country.

* Joseph Cooper Esq. of Gloucester county, New Jersey, made the following communication to *the Burlington Society for promoting Agriculture and Domestic Manufactures.*

"I put a quantity of comb, from which the honey had bed drained, into a tub, to which I added a barrel of cider directly from the press. The mixture was well stirred and left to soak for one night; it was then strained, before a fermentation had taken place, and honey was added until the strength of the liquor was sufficient to bear an egg. It was then put into a barrel, and after the fermentation commenced, the cask was filled every day for three or four days, that the filth might work out at the bung hole. When the fermentation had moderated, I put the bung in loosely, lest stopping it close might cause the cask to burst. At the end of five or six weeks the liquor was drawn off into a tub and the whites of eight eggs well beat with a pint of clean sand were put in-

Honey is the purest and most agreeable sweet substance, Providence has provided for our comfort, and was long used before the art of extracting sugar from the cane was known. The productions of this tribe of insects were of singular utility to the eastern nations, and to this day they rank high among the articles of traffic. Mr. Shaw, whose travels extended into the land of Judea, states that Hebron, though much degenerated from its ancient lustre, now sends annually into Egypt three hundred camel loads of this valuable article."

Other modern travellers confirm the scripture declarations, that Palestine was a country that abounded with honey. And though God did not allow his ancient chosen people to offer honey in their sarifices, a satisfactory reason may be assigned for this prohibition. It was offered by the heathen to their idol gods ; and the true God designed to keep his people at a distance from the customs of the heathen ; but he commanded them to present the first fruits of it to him ; and these first fruits and offerings were intended for the support of his priests and not to be offered upon the altar. God gave honey to the Jews for their nourishment ; and it was the glory of the promised land, that it flowed with milk and honey ; and John, the harbinger of the Prince of Peace, fed on the treasures collected by these industrious insects.

to it. I then added a gallon of cider brandy, and after mixing the whole together, I returned it into the cask, which was well cleaned, bunged it tight and placed it in a proper situation for racking it off when fine. In the month of April I drew it off into kegs for use, and found it equal, in my opinion, to almost any foreign wine, and in the opinion of many others it was superior. This success has induced me to repeat the experiment for three years, and I am persuaded that by using clean honey instead of the comb as above directed, such an improvement might be made, and would enable the citizens of the United States to supply themselves with a truly American wine, and it would have this peculiar advantage over every other wine hitherto attempted in this country, that it contains no foreign mixture, but is made from ingredients produced from our own farms."

There is a wholesome and pleasant liquor called Methiglin, invented by Matthew Glinn. This is made by infusing honey into clean water until it will bear an egg ; then boiling and skimming as long as any thing will rise ; put it into a cask and keep it a few months, and it will be fit for use.

MEANS OF PRESERVING MILDEWED WHEAT.

[N. York Agric. Soc. Publications.]

A FINE piece of wheat being lodged by heavy rains, and being soon after perceived to be infected with the mildew, was cut, though in a perfectly green state, about three weeks before the usual time of cutting. It lay spread abroad upon the stubble until it became dry enough to prevent its caking in the sheaf, when it was bound and set up in stacks. The result of this treatment was, that the grain, though small, was of a fine colour, and the heaviest wheat which grew upon the same farm that season, owing, no doubt, to the thinness of its skin. What appears more remarkable, the straw was perfectly bright, not a speck upon it. The idea of the judicious manager, in whose practice this experiment took place, is, that cutting the crop, "as soon as it is struck, kills the mildew," and on this principle he practises himself, and recommends in general terms the cutting of mildewed wheat as soon "as it is struck." It is well understood that the sap or nutriment, as soon as it is in the stems of grain that is cut unripe, circulates to the ear, and fills the grain in the same or in a similar manner as it would have done, had the stems remained upon their roots. Hence the advantage of cutting mildewed wheat as soon as it is infected with the disease, seems to be, that by thus stopping the disease the nourishment in the straw passes to the ear in a pure, untainted state.

Marshall's Gloucestershire, vol. ii. p. 54.

When the wheat stem has a very particular cast of colour of bluish green, it is surely affected by the mildew.

Young.

ON THE EXCRETORY DUCT OF THE FEET OF SHEEP.

[R. R. Livingston Esq.]

THE diseases of animals and their cure, depending upon an accurate knowledge of their structure, I take the liberty to mention an observation upon that of sheep, which indeed was so obvious, that I conceived no farmer, and much less the naturalist that treats of this useful animal, could be ignorant of it;

till I found on speaking on the subject to many experienced husbandmen, and particularly to many members of this society, at a full meeting, that only one of the members had attended to the circumstance I allude to; nor is it noticed by Buffon or by Lisle, who treat largely on the diseases of sheep. This must be my apology to those who find no novelty in the following remark; the legs of sheep are furnished with a duct, which terminates in the fissure of the hoof; from which, when the animal is in health, there issues a white fluid, but when sick these ducts are stopped by the hardening of the fluid.

I have in some instances found that the sheep were relieved, merely by pressing out the hardened matter with the finger, from the orifice of the duct in each foot; perhaps it may be proper in some cases to place their feet in warm water, or to use a *probe* or *hard brush* for cleansing this passage.

May not the ill health of sheep in wet or muddy pastures, be in some measure ascribed to the necessity of keeping the duct I have mentioned free and open?

N. York Agri. Soc. Pub.

NEW INVENTED CHURN.

The letters of Mr. Halliburton, which follow, and the *drawing* which accompanies them, together with the admirable description of it in the references to the plate, will enable every man to form some judgment of Mr. Halliburton's new churn, and every workman to execute it.

It is certainly a simple, ingenious contrivance, saving much labour, and we believe affording a much more neat mode of cleansing the butter from the butter-milk than any plan heretofore adopted.

It is no new contrivance at which farmers need be alarmed. It is simple, plain, intelligible, and has stood the test of experience. The trustees of this Society directed that one should be made, and they have received it through the kind attention of Mr. Halliburton. It has been repeatedly tried by one of the Trustees, and successfully. A child of six years of age, or even five, can make the butter, while the mother is employed on other work.

If we should venture to propose an improvement, it would be that the hole or opening, and the piece of wood which closes it, should be square instead of oval, and considerably larger, because the butter is formed into a square lump nearly the size of the churn, and it will not drop out of the hole without cutting it. Perhaps it would make the churn tighter, if there was a rabbit round the cover to the hole.

It is certainly true, that butter remarkably well freed from the butter-milk, and equally salted, has been repeatedly made in this churn, by a person who had no other knowledge of the churn, than what was derived from the following letters.

[To the Recording Secretary.]

Portsmouth, *January* 11, 1814.

SIR,

SEEING by an advertisement in a Boston paper that you wish for a mode of making butter, which shall not require in any part of the process the application of the hands to the butter; I take the liberty to lay before you the mode in which my family have made butter for several years past, in a churn of my own invention, of the form of half a cube.

It should be remarked, however, that sometimes the butter will come so extremely soft, that we are obliged, after washing away the butter-milk, to turn the butter out of the churn into a milk-pan, and batter out the water by a wooden paddle—and even this will not answer, until the butter is rendered harder by keeping it a day in some cold place.

My churn has been adopted by a number of families in this vicinity, but I do not know whether they use it in the same manner as we do. A. HALLIBURTON.

PLAN OF A CHURN FOR MAKING BUTTER, PERFECTLY FREE FROM BUTTER-MILK OR WHEY, WITHOUT APPLYING THE HANDS TO THE BUTTER DURING THE PROCESS.

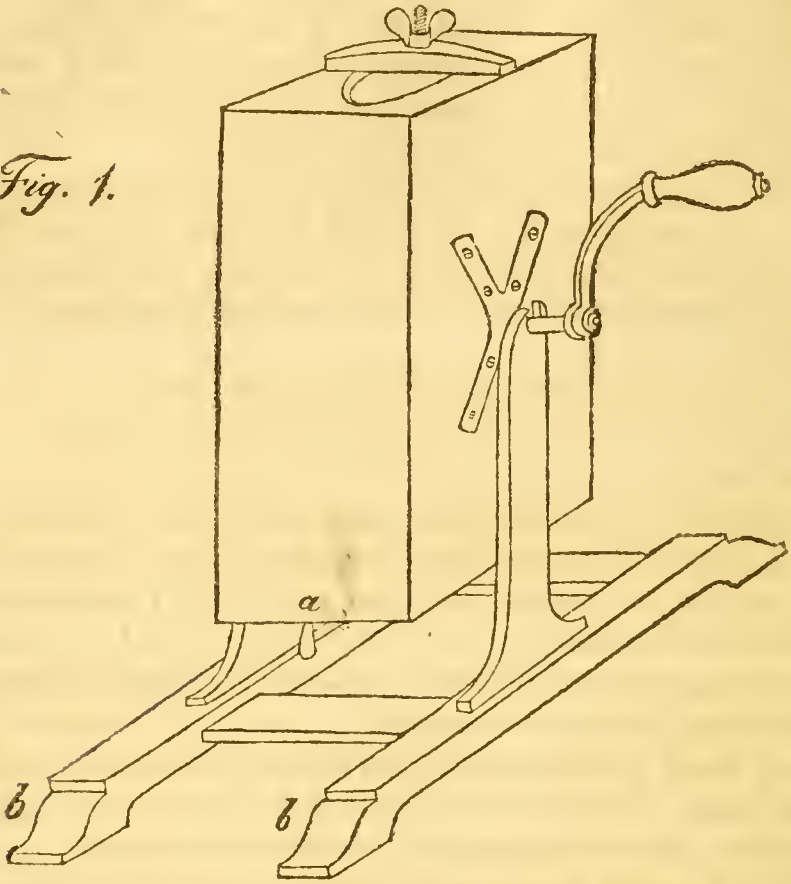

Fig. 1.

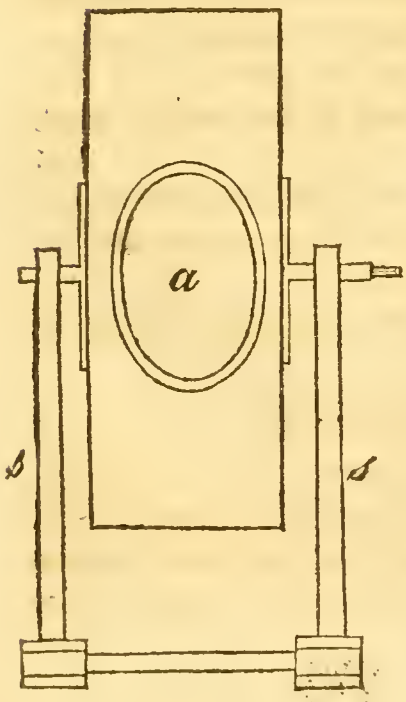

Fig. 2.

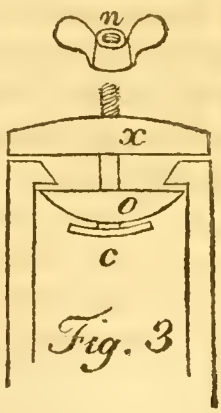

Fig. 3

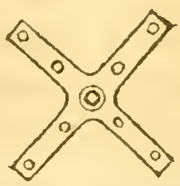

Fig. 4.

DESCRIPTION.

The Churn is a perfectly tight box, sixteen inches square and six inches wide. One of these dimensions will contain four gallons, and is of a proper size for churning two gallons of cream.

At Fig. 1 is an oblique view of it with its support, and shewing the manner in which the axle is secured to it with screws.

In one of the angles, as at *a*, is a hole, with a top, by which when turned down, the butter-milk is drawn off; and when turned up the air may be let out. The pieces *bb* which form the feet should be at least twenty inches long, that it may stand firmly.

At fig. 2 is a direct view of the machine, with the top turned to the eye—*a*, the aperture for putting in the cream. This should be cut sloping, so as to leave half an inch of wood within on the sides. The upright pieces *ss*, in which the box hangs, should be no higher than is necessary for it to turn freely.

Fig. 3 is a section of the upper part of fig. 1, to shew how the opening is closed.

o is an oval piece of wood, one inch thick, and half an inch larger every way than the opening; through the middle of this passes a bolt *c*, with a broad head at one end, and a screw cut in the other. The head of the bolt should be neatly let into the oval piece, that the surface may be uniformly smooth.

x is a bar of strong wood, through which the bolt passes freely, to be placed across the middle of the opening.

n is a screw-nut, which, when forced down on the bar, draws up the piece *o* very forcibly, and if the work is good, closes the opening effectually.

At fig. 4, one of the two pieces which form the axis of the machine is seen endways, to shew the branches, pierced for screws, by which it is fixed to the box.

The scale at the side is for measuring the parts of the three last figures.

MANNER OF USING THE CHURN.

1. After putting in the cream, screw the cover up perfectly tight and turn the crank, (which a child six years old can do,) for fifteen or twenty minutes, and when the butter is separated from the butter-milk, which is known by the dashing sound

occasioned by the butter, draw off the butter-milk by a tap made in one of the lower edges of the churn.

2. Pour into the churn a pailful of perfectly clear, cold water from a good well or spring; close the churn, and turn it round for about three minutes, by which time the butter will form into innumerable small, round lumps, about as big as peas, or grains of wheat, according to the more or less hard state in which the butter first comes, which, by dashing against each other, and the square sides of the churn, will become very solid, (aided by the cold of the water,) and be entirely free from any butter-milk or whey.

3. Draw off the water, and put in another pailful; turn the churn one or two minutes; then draw off the water again; and so continue to do, until the water comes out as clear as when first put in.

4. Let the churn remain at rest with the tap downwards until no more water will drain out; then, while the butter is in this very divided state, scatter among it rather more than the usual quantity of finely pulverised salt, stirring the butter with a clean stick, so as to salt the butter very uniformly throughout; then close the churn and turn it round slowly, and the butter will form into one solid lump. Continue to turn the churn for about ten minutes, so as that the butter may fall with force against the sides of the churn, occasionally stopping to let the water squeezed out run from the tap, and when no more water appears the work is finished.

[To the Corresponding Secretary.]

Portsmouth, April 7, 1814.

SIR,

Agreeably to your request, I have caused a churn to be made, and have delivered it to the waggoner of Messrs. Shaw and Leavitt, who has promised to deliver it you without injury.

The cost of the wood work and painting is	\$2 50
do. iron work,	1 75
	\$4 25

The joiner and blacksmith whom I employed, have not made it so neatly as I desired, but I hope the operation of it when tried will equal the anticipations excited.

You ask me why the butter does not pass off with the butter-milk and water. The answer is, that the butter, being lighter than water or milk, necessarily floats at the top; consequently all the water must pass off before any of the butter can descend to the hole, which at this time is placed at the lowest corner of the square.

In trying this churn, if the butter should not come so soon as I have mentioned in my former letter, some allowance ought to be made for the season of the year, the comparative thinness of the cream, and also the too general want of knowledge of the proper temperature of the cream, when best disposed to churn speedily.

The following are some of the variations I have observed in the churning of butter *in this kind of churn.*

1. When the cream is thin, and too cold, it will sometimes take an hour to churn it, and it will then come in lumps as big as robbins' eggs.

2. When the weather has been long very hot, and the cream at the time of churning is too warm, the butter will come so soft, that the little particles will stick together with the slightest touch.

3. When the cream is in the best possible state, if the churning is too long continued after the butter has come, the little lumps and grains will sometimes unite into lumps as big as a hen's egg, which ought to be avoided, because the butter is best washed from the butter-milk when in the state of small, hard grains.

In using this churn, care is to be taken that a too swift motion is not given to it, because the cream will thereby acquire a centrifugal force—perhaps the proper motion is fifty or sixty turns in a minute, to give it its greatest force. It ought not to be filled more than half full nor less than one eighth. I think ten pounds of butter is the utmost quantity that can easily be churned in one of this size.

In putting in or taking out the cover, the screw should not be turned entirely off, but merely loosened, the cross stick serving for a handle to the cover; and when the butter is completely finished, the mouth of the churn is to be turned downward, so that the lump may fall into a clean dish, and by means

of a fork, be placed into a pickle tub, and kept constantly under the strongest brine until used.

I hope you will pardon my prolixity, when I assure you that it is occasioned by a desire to promote the objects of so useful an institution as the Massachusetts Agricultural Society.

ANDREW HALLIBURTON.

Note. As it may be wished that a plan should be devised to enable farmers to make butter, (if they choose,) through the whole summer, I give the following mode, as adopted in my family. Let a shallow box or trough be made of boards, eighteen inches wide, five inches deep, and from ten to twenty feet long, with a cover to shut out flies, &c. place the milk-pans in this; then let a constant small stream of cold water run into it at one end, and out of it at a hole at the other end, only so that the water shall not rise in the box high enough to flow into the pans, and the milk will be kept perfectly cool in the hottest weather, and the cream capable of being churned.

MACHINES FOR RAISING WATER FOR THE PURPOSE OF IRRIGATION, OR WATERING LANDS.

The Committee appointed by the Board of Trustees to consider the merits of several machines for raising water, presented for the premium offered by the Board, having attended to the business referred to them, beg leave to report, that they are gratified with the prompt attention which several gentlemen have paid to the invitation of the Trustees, and the ingenuity displayed in the several machines.

The fertility of land has been considerably increased by the practice of irrigation in Europe, and it was the opinion of the Board that the introduction of this useful process here would be beneficial to the agriculture of our country.

To this end a simple and cheap machine was requisite to raise water for the purpose; a premium was therefore offered for such a machine. To be extensively useful, it should be simple, that it may be easily constructed; and not attended with much expense, that every farmer who has water on his grounds

may avail himself of it with a rational prospect of indemnification.

A current of considerable velocity, or a situation where a head of water may be obtained, is not possessed perhaps by one farm in fifty; the machine therefore in which a water wheel is the moving power, and that with forcing pumps which requires a head of water, both which would, no doubt, be adequate to the intended purpose in favourable situations, do not come within the views of the Trustees.

The author of the communication marked △ seems fully aware of the desire of the Trustees; but the Committee apprehend that one of the materials to be used in the construction of the propellers, will not be sufficiently durable in contact with water, and that there may be considerable difficulty in attaching it to the other parts.

They apprehend too that the estimated expense of the machine is very much below what it would really prove; that the supporters of the moving power are placed too low to receive the influence of the wind, and if elevated to a sufficient height, could not be managed with ease and expedition in sudden and violent gusts.

The Committee regret that in the draught of this machine, the proportions of its several parts have not been attended to, and are therefore not able to form a correct judgment of its practicability. They desire a further communication from the author on all the points above stated.

March 26, 1814.

At a meeting of the Trustees of the Massachusetts Society for promoting Agriculture, the above report having been read, was accepted, and ordered to be published. The author of the communication, marked with a triangle, is requested to consider the objections stated in the above report, and to make such remarks thereon as he may think calculated to obviate them, if they can be obviated. The publishing Committee return the thanks of the Trustees to him and to the other ingenious gentlemen who suggested projects for the same purpose. They invite them also, and all others who have a taste for, and knowledge of mechanical or philosophical arts, and especially hydrau-

licks, to turn their attention to this interesting desideratum, that of raising water at a cheap rate, for the purposes of irrigation.

The Trustees do not presume that the small premium which only their limited funds enable them to offer, will be any strong inducement, but they rely on the patriotism of the men of science and mechanical knowledge, who must recollect that a person who should invent a cheap machine calculated for general use for this interesting purpose, would be deservedly esteemed a great benefactor to his country.

AGRICULTURAL INTELLIGENCE.

A quantity of wheat was raised the last season in Medford in the county of Middlesex by Capt. John Symmes, without any appearance of blight or mildew.

An attempt is making the present season to raise hemp upon some of the intervale lands on Merrimack river in the state of New Hampshire.

The shepherds in Spain cure the scab in sheep with an ointment made of the trunk and roots of the Juniper, by breaking them into small pieces, and infusing them in water; without adding any thing else.

It has been found that mixing a small proportion of any kind of oil with the tar used in tarring trees, preserves it in so moist a state for some time as to preclude the necessity of repeating the operation so frequently, as heretofore has been found necessary.

The common mustard seed which grows with very little cultivation, and is easily gathered and cleaned by those farmers, who have floors for threshing wheat or flax seed, is worth from three to four dollars per bushel. An acre of good land will produce from fifteen to twenty bushels.

To make good butter in hot weather. The day before churning scald the cream in a clean iron kettle, over a clear fire, taking care that it does not boil over. As soon as it begins to boil or is fully scalded, strain it, when the particles of milk which tended to sour and change the butter are separated and left behind. Put the vessel, into which it was strained, into a tub of water, and place it in a cellar till next morning, when it will be ready for churning, and become butter in less than a quarter of the time required in the common method. It will also become hard with a peculiar additional sweetness and will not change. The labour in this way is less than the other, as the butter comes sooner, and saves much labour in working out the butter-milk. By this method good butter may be made in the hottest weather.

The Rev. F. Haggitt, Perbendary of Durham, England, has lately stated a successful experiment for saving the consumption of flour in making bread. Mr. Haggitt gives the following account of the process : I took five pounds of bran, boiled it, and with the liquor strained from it, kneaded 56 pounds of flour, adding the usual quantity of salt and yeast. When the dough was sufficiently risen it was weighed, and divided into loaves ; the weight before being put into the oven being 93 pounds 13 oz. or about 8 pounds 10oz. more than the same quantity of flour kneaded in the common way. It was then baked two hours and some time after being drawn, the bread was weighed, and gave 83lbs. and 8oz.—loss in baking 10lbs. and 5oz. The same quantity of flour kneaded with common water loses about 15lbs. 10oz. in the baking, and produces only 69lbs. 8oz. of bread ; gain by my method 14lbs. that is, a clear increase of one fifth of the usual quantity of bread from a given quantity of flour. He also states that the bran, after being used in this way, is equally fit for many domestic purposes.

OFFICERS OF THE SOCIETY.

CHOSEN JUNE, 1813.

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ERRATA

In last publication (No. 1. Vol. III.)

Page 42, line 23, for "*a* paper mulberry," read, *or* paper mulberry.
55, — 2, from bot. "As in all parts &c." read, A small part, &c.
56, The word *rocky* in the first line ends the answer to the 2d question. The twelve following lines are part of the answer to question 5th, and should follow the word *bushels*, page 57, line 2.
58, — 14, for "howed," read, hoed.
61, — 28, dele semicolon after *&c.* and add a period after *winter.*
— — 30, add a period after the word *corn.*
— — 31, dele period after *salt-water.*

ERRATUM, (No. 2, vol. III.)

Page 154, line 3 from bottom, for "ferina," read, farina.

MASSACHUSETTS

AGRICULTURAL JOURNAL.

Vol. III. JANUARY, 1815. [No. 3.

ON THE ROOT OF SCARCITY.

To the Trustees of the Massachusetts Agricultural Society.

It is well known to all of us, that the *root of scarcity*, as it has been often called, has, in most countries of Europe, been very celebrated for its great products, and its valuable properties as food, both for men and domestic animals. Its cultivation, however, especially in this country, has been in no degree proportionate to the favourable accounts which have been given of it. I have thought that, at a moment when the extended propagation of sheep appears to threaten the diminution of the number of other valuable domestic animals in consequence of the scarcity of food, it would be useful to turn our attention to such plants as may have a tendency to prevent this scarcity. It is the more important in our country since the severity of our winters precludes us from using the turnip as green fodder for our sheep during the winter months.

The best account I have seen of the root of scarcity may be found in the Abbé Rosier's *Cours complet d'Agriculture*, from which the following translation has been made. I do not vouch for the accuracy of the statements, but the public may rest assured that it is the most approved work on agriculture now in use in France. The plant has been cultivated successfully here, and thrives with us as well as in France.

J. LOWELL, *Corresponding Sec'ry.*

Dec. 3, 1814.

Abbreviated translation of the Abbé Rosier's remarks on the "Racine de disette," [root of scarcity] *or Bête rave champêtre,* [field beet.] *It is the Beta albissima of Linnæus.*

The field beet, somewhat harder and less sweet than the common garden beet, grows like that chiefly above ground, into which it does not penetrate more than half its whole length. It would be apt to rot if you should cover it with soil.

It has one extremely valuable property, and that is, that you may strip it repeatedly of its leaves and thus furnish a most abundant forage for cattle, and it will rather thrive upon it, while the common beet is much injured by such treatment.

Its culture is easy—its advantages numerous. It will supply the place of all other food for cattle. It succeeds in all soils, and especially in those which are humid or light.

This root is very little affected by changes of weather. It is attacked by no insect—drought affects but little its vegetation. It prepares the ground extremely well for other crops. It is known in Germany by the name of mangel-wurzel. Rosier recommends that the root of scarcity should be sown in beds, and then transplanted, but this expense is not necessary. It may be sown and treated precisely like the common beet, except that they ought to stand eighteen inches asunder those that are left to grow.

The more the land is manured and cultivated, the better the plants. In ordinary land, with common culture, they will only weigh five or six pounds a piece, and the leaves can only be stripped four or five times in a season. In good land they often weigh nine or ten pounds, and are stripped eight or nine times. In a light, sandy, but well manured soil, they sometimes weigh fourteen and even sixteen pounds each!

The first crop of leaves in France is taken off in the latter end of June, or the beginning of July. In this country, probably, the latter period would be preferable. The lower leaves, those which incline towards the ground, are those which are taken away, and care must be taken to preserve the top leaves or the crown of the plant. The leaves may be taken off every fifteen days after the first gathering. Oxen, cows, and sheep devour them greedily, and fatten readily upon them. All do-

mestic poultry eat them readily when chopped fine and mixed with grain. Horses will feed upon them very well, mixed with chopped straw. Hogs also fatten upon them.

REMARKS.

Cows fed upon them solely, give a greater quantity of milk and cream, and of better quality for the first fifteen days, after which they grow too fat and the milk lessens. The food of cows must, therefore, be varied. Oxen and sheep fatten very well upon them. Cows should have grass in the proportion of one third to the beet leaves, or every third day they should be turned to grass. In this mode their milk will be excellent. The trouble of gathering the leaves is less than that of gathering any other green fodder. It may be done by children, while men are required to cut other green food for cattle. It is the surest crop since the plant will stand the largest droughts. He adds, that the leaves make an excellent vegetable for the food of men, but as in our country we have such an abundance of green vegetables, this may be deemed of small consideration.

The roots are gathered and treated like those of the common beet. The skin is very tender and care should be taken to handle them so as they may not be wounded, as they will, in that case, not keep so well.

In order to preserve the seed in purity, care must be taken to change the ground in which the seed-beets are planted.

The seed can be preserved after it is gathered three or four years without injury.

In giving these roots to cattle for food, they are first washed and then cut up into pieces about the size of a nut.

It is always best to accompany them when given to horned cattle with clover, or other hay or straw, and if the hay or straw has been previously cut fine, it will be preferable.

If horses are fed with this root, with a proportion of hay or cut straw, (half of each,) they will be fat, vigorous, and healthy. If they are worked severely, a little oats or corn may be added. It is thus they are treated in Germany, where this root stands in the stead of meadows or grass lands, and whose excellent horses are well known.

Hogs fed upon them raw, after they have been cut up fine and mixed with milk or other drink, fatten as well upon them as upon boiled potatoes, by which the fuel and trouble of boiling is saved.

As to the quantity given to animals, much will depend on the proportion of other fodder which you allow them. Cows fed twice a day upon eighteen pounds of these roots at each time together, with four pounds of hay or chopped straw, will give as much and as good milk as in summer, and they will be kept in the best possible state.

Oxen fed with forty weight of these roots per day, with ten pounds of hay for one month, and after that with fifty weight per day of the roots alone, will be fat enough for sale in two months more.

Any person disposed may, from the facts above stated, calculate how many cattle will be supported by a single acre on which this plant is cultivated. Its benefits are indisputable.

The Abbé concludes with this summary:

1st. Men can eat this vegetable throughout the year. It is agreeable and healthy.

2d. No insect whatever attacks it. It suffers little from the variety of seasons.

3d. The leaves of this plant form alone an excellent food for every species of domestic quadruped during four months in the year. Turnips and other vegetables are besides liable to be destroyed by insects, whereas this beet is not.

4th. The roots can be preserved eight months in a sound state, while turnips are of little value after March.

5th. In some soils turnips will not grow, particularly in those that are very stiff or strong. The root of scarcity grows every where.

6th. The milk of cows fed on turnips has a bad taste. That of those fed on this plant is excellent as is also the butter made from it.

This forage or green fodder comes also at the hot seasons, when almost all the green food is scarce and sometimes not to be procured. Cattle never get tired of it. In many parts of Germany where it is raised with success, they prefer it to every thing else to fatten those large herds of cattle which they annually export to France.

ON CUTTING CARROT LEAVES AS A GREEN FODDER.

[We introduce the following extract from the Repertory of Arts and Manufactures, not so much because we place confidence in the suggestions of the author, as that we think they are most fully proved to be unfounded by the very satisfactory experiment of the Hon. Mr Quincy which follows.

It will be observed that the English writer does not speak of his own experiments, but of those of a friend, nor is there that accuracy in comparison and detail which would be requisite to establish a fact so contrary to all analogy and experience.

We introduce the British opinion because one similar to it appears to prevail in this country. In our last number we published a suggestion of the same nature, and requested gentlemen of leisure who were in the practice of cultivating the carrot to make the experiment carefully. This has now been done by our colleague, Mr. Quincy, and one can scarcely conceive any thing more perfect. We shall consider the question therefore as settled, that carrots follow the laws of other vegetables whose growth depends nearly as much upon the leaves as upon the root.

It ought to be observed in favor of the English writer, that the plant was not deprived of its leaves till some of them had begun to decay, nor until the root had probably attained nearly its size. We cannot believe however even in the case stated the result would have been in favor of the mown carrots.

There is a difference it must be admitted in the œconomy of different plants. While some will instantly perish if deprived of their leaves, others appear to suffer but little comparatively. Hence where the value of the leaf is either the principal cause of its cultivation, or bears a very considerable proportion to that of the root, it is often expedient to pluck it. This is the case with the woad and some other plants. Hence too it may be politic to strip the Mangel Wurzel or root of scarcity (of which we have inserted some account in the present number) because it appears that its leaves are renewed with great rapidity and furnish repeated crops of very valuable fodder. The leaves of the carrot, on the other hand, are of slow growth and

do not attain the size which they had when cut in July till late in September. We have been more full in this note because the subject is interesting, because opinions in opposition to the result of Mr. Quincy's experiment appear to have been entertained in Europe and America, and because it might appear in some degree contradictory that we should insert an article in this same number recommending a similar treatment of the root of scarcity to that which we censure in the cultivation of the carrot.

We are not answerable for the accuracy of the Abbé Rosier, and are not convinced that the root of scarcity would not be more profitable if not stripped of its leaves, though we can see reasons why that plant should not suffer so much by such a privation as the carrot and potatoe.]

METHOD OF MAKING HAY FROM THE LEAVES OF CARROTS, AND IMPROVING THE SIZE OF THE ROOTS.

BY RICHARD WESTON, *of Leicester, England.*

[From the Repertory of Arts and Manufactures.]

EVERY quadruped which feeds on carrots improves and soon gets fat; also geese, ducks, fowls and turkies as I have proved by my own experience. The leaves are known to partake of the same nutritious quality as the roots, but the value of them is lost by our not knowing a use to which they may be applied with advantage, that is making them into hay.

About the end of July or beginning of August, when the leaves appear to be fully grown and the lower ones begin to wither, mow them, but do not let the scythe cut the crowns of the roots from which the leaves are produced, as this will prevent their shooting out again. As soon as the leaves are mown they must be carried off the ground, spread about thinly and made into hay in the usual manner. At first they must be frequently turned to prevent them from moulding.

The ground being cleared, you have an opportunity of seeing where the carrots grow too thick. Thin them to a proper distance of eight or ten inches asunder, as you would wish them to be either small or very large, and let the land be well hoed;

receiving a check from the leaves being cut off, they will soon put forth fresh ones. But the consequence must be, that their roots will increase in size. To prove the utility of hoeing, leave a part not hoed and a small part not mowed to convince you of the propriety of the method above stated. I have seen this method practised by Mr. Baker, of Bristol House, near Leicester, and attended with great advantage. The produce was very great compared with his crops of grass hay. The field of carrots was between three and four acres.

Quincy, 27*th October*, 1814.

Sir,

The Massachusetts Society for Promoting Agriculture having expressed a wish,* that the fact might be ascertained, whether, as had been asserted, the top of the carrot might be cut, as a green fodder, without injury to the growth and productiveness of the root, I was induced to make an experiment upon a scale, calculated, as I hoped to put the question at rest.

I caused twenty-six beds of carrots to be laid out, side by side—an alley of one foot width between each—in length of beds, in number and width of rows, in quality of soil and equality of cultivation, in every respect, as far as possible, they were similar. In the month of July, when the lower leaves first began to wither, I caused every other bed to be cut, as directed, being careful not to crop the crown or head of the root. So that there was *a cut and an uncut bed* alternately through the whole piece. About the 20th instant, I caused these beds to be dug and each measured separately and its product compared with the product of the adjoining bed. The result was singularly uniform, and for the difference no cause is perceptible, except that produced by the operation of cutting the tops.

Their respective products were as follows:

Product of uncut bed.		*Product of cut bed.*	
No. 1	8 bushels.	No. 1	5 bushels.
2	$7\frac{1}{4}$ do	2	5 do
3	$7\frac{1}{2}$ do	3	$4\frac{1}{4}$ do
4	9 do	4	$5\frac{1}{2}$ do

* See p. 46, and p. 99 of this volume.

No. 5	9 bushels.	No. 5	5 bushels.
6	10 do	6	5½ do
7	9 do	7	4 do
8	7¼ do	8	4¼ do
9	7 do	9	3 do
10	7 do	10	4¼ do
11	7¼ do	11	4 do
12	8 do	12	4 do
13	8¼ do	13	4¼ do

Bushels 104½, total product of the uncut beds.

Bushels 58, total product of the cut beds.

The above must be understood to be the product of the roots. The tops having been cut off before measurement.

Judging by the eye, the size of the roots of the *cut beds* was nearly two thirds less than that of the *uncut beds*. In order to estimate this point more accurately I caused one bushel of the roots taken indiscriminately from one of the *uncut beds*, to be counted, and also one bushel of the roots taken indiscriminately from one of the *cut beds*. The former contained *two hundred and seventy-one* carrots. The latter *six hundred and forty-four*. On weighing the bushel of carrots taken from the *uncut bed*, I found it weighed *fifty-three pounds*. That from the *cut bed* weighed *forty-eight pounds*.

On weighing the tops cut from each of the above bushels respectively, the weight of the tops of the bushel from the uncut bed was *fifteen pounds*, that of the cut bed was *nineteen pounds*.

From all which I think it sufficiently apparent that the doubts of the Society, expressed in the forty-seventh page of the present volume were well founded, and that the carrot forms no exception to the usual analogy observed by nature in the growth of vegetables.

I am Sir, very respectfully,

Yours, &c.

JOSIAH QUINCY.

To the Corresponding Secretary.

STATEMENT RESPECTING MERINO SHEEP.

Jamaica Plains, 13*th June*, 1814.

SIR,

IN September, 1810, I purchased five full blooded ewes and a ram, of the *Paular flock*, which were just landed from Spain, and in good order; and supposing it would be gratifying to the Agricultural Society to know the *progressive improvement* in their fleeces, and particularly so in those of their progeny, I give you the following statement, having myself particularly attended to the several shearings:

Of 1811, I have lost the memorandum.			
.. 1812, the five fleeces of the ewes weighed -	lb. 25	4 oz.	
.. 1813, of same five sheep	29	12	
.. 1814 do do	32	3 oz.	
The average of these last - -		is 6	7 oz.
Of 10 fleeces from lambs or sheep raised from them, of the 2d and 3d shearing		7	4
.. 9 fleeces from lambs raised from the imported merinos, first shearing		8	11

Making the average of the flock seven pounds ten ounces in the yolk or grease. In consequence of the many rains before shearing, my wool was never so clean or free from dirt at any previous shearing. They are never yarded or housed, but at night—this they are the year round for fear of dogs.

I do not observe the least falling off in the quality of their wool. My little flock now consists of twenty six ewes, and I have on hand twelve rams, and eight have been sold; all of them were produced from the five first purchased, and several are again near yeaning. I have never lost a full-blooded sheep or lamb since I commenced keeping them.

I am, &c. &c.

JOHN PRINCE, Jr.

To the Corresponding Secretary.

N. B. Having kept some *common* sheep at the same time, I am satisfied the merinoes eat less, and keep in better order on the same food, and are, to say the least, as hardy.

ON THE CULTURE OF RHUBARB.

[The following article from a very intelligent correspondent, on the cultivation of rhubarb, is certainly deserving of attention, because the real rhubarb is a hardy plant which will flourish extremely well in our climate, and there is no reason why we should import it at great expense from foreign countries. But we are persuaded from the history which he gives of the plant now cultivated in the county of Hampshire, that it is not the true rhubarb employed in medicine. The plant sent by Mr. Vaughan to Judge Strong, we are persuaded is the *rheum undulatum*, a plant which the former gentleman introduced, and has sent to many of his friends. Its leaf-stalks are used as a preserve for tarts, and are equal or superior to the gooseberry for this purpose.

The true rhubarb is the *rheum palmatum*. This plant is also in some of our gardens, and may be propagated with as much ease as the other.

All the species of *rheum* have roots which resemble each other in their texture, size, and in some degree in their medicinal qualities, as it is said, but the rheum palmatum is much the most powerful. We are satisfied that our respectable friend, whose object is the promotion of the best interests of his country, will excuse us for explaining this subject. We are satisfied we are right, as we are well acquainted with both plants, and have often seen them.

We think it highly improbable, that the plant sent to Judge Strong was the true rhubarb of the shops, since we know that the one which was distributed by Mr. Vaughan was not so. That gentleman, we are satisfied, never supposed it to be the rhubarb of medicine. This notice we insert, because it may induce some persons to undertake the cultivation of the *rheum palmatum*.]

COMMUNICATION FROM JUSTIN ELY, ESQUIRE, RECOMMENDING THE CULTURE OF RHUBARB.

West-Springfield, August 20, 1814.

Doctor Aaron Dexter,

DEAR SIR,

The United States are annually at considerable expense for the article of rhubarb. Perhaps no country in the world can more easily and successfully raise rhubarb for consumption and for exportation than New-England, and perhaps every part of the United States. Small pieces of the roots put into ground in the spring, will commonly grow as well as a piece of dock root. It has been successfully raised in this neighbourhood for several years past. I intend to send you some for trial in October or November next; some physicians have tried it, and judged it as good as the best imported.

In the fourth volume of the American edition of Willich's Domestic Encyclopœdia, from page 381 to page 385, is a particular account of the encouragement given by the Society of Arts in England for raising it, and of the method of raising and curing it, which I wish you to read, and I think it would be giving beneficial information to the community to publish that account in one of your Numbers. The seed are apt to blast in this part of the country, but from thirty to forty slips or off sets for setting out may be had from one large root that is taken up. Slips of the length and bigness of one's little finger, cut from the crown of the root downwards, answer well to set out. There is some variety in the rhubarb propagated in various parts of the country. The rhubarb we have, was sent by Mr. Vaughan of the District of Maine, to the late Judge Strong of Amherst, and is supposed to be genuine.

I am, &c.

JUSTIN ELY.

ON THE CULTURE OF BURNET.

It is much to be regretted, that the enthusiasm which is apt to be excited in favour of new discoveries should be extended to agricultural experiments. Yet, perhaps, no art has suffered more than this most important one, by the extravagance of those who fancy that they have discovered some new improvement in it. Instead of deliberate and cautious experiments, we are often led astray by rash and zealous men, who, finding a new plant or a new machine for the abridgement of labour, are wont to represent its advantages in language rather suited to works of fancy, than to those of sober experiment.

Hence it has often happened, that a new discovery in agriculture having been improperly and extravagantly praised, and having, upon experiment, been found to fall far short of what had been promised, has been precipitately abandoned.

We could enumerate some hundred instances of this nature. The article of *burnet* furnishes us with a striking example, and we are induced to select it at this time, because a very respectable Society of agriculturalists at Chelmsford have sent to this Society a request for their opinion as to the culture of this plant, and one of our associates has also selected an article on this subject, which we shall subjoin with the following preliminary remarks.

It is the duty of an Agricultural Society, to encourage the culture of any plants which afford a reasonable prospect of improvement, but it is equally their duty to state all the doubts and difficulties, which have been suggested to such cultivation in other countries.

About twenty or thirty years since burnet had a very considerable reputation in Great-Britain, and was spoken of as a most admirable fodder, particularly for sheep. It is not, however, to be denied that its culture has not generally succeeded in Great-Britain.

The late excellent Dr. Dean, in his georgical essays, appears to have caught the enthusiasm which at that time prevailed in Great-Britain.

In addition to the important fact, that its culture has not been favoured in England since the period when it was so highly recommended, we ought to say, that the celebrated Miller, the ablest gardener and cultivator of that kingdom, and Dr. James Anderson, much distingnished for his writings on agriculture, both condemn it.

But if it had succeeded in Great-Britain, there are reasons why its culture would not be profitable in our country. It is a plant which is much disposed to preserve its growth in England, in the winter months. It is recommended chiefly on that account as a winter food for sheep.

But our climate is so much more severe, that we can scarcely hope that a plant perfectly vivacious through a British winter will succeed in our country; and it is a well known fact, that the plants which retain their verdure in that country through the winter, do not stand our winters as well as other plants which lose their foliage earlier.

Plants that are evergreens, with them are more apt to perish in our climate than those which are deciduous.

The burnet has been tried, and pretty fairly, in our country, (we mean in New-England,) and it has been very generally destroyed by our severe frosts.

These remarks as guardians in some measure of the agricultural interests, we thought it our duty to make before we introduced the following articles. Yet we earnestly solicit the wealthy experimental farmers to try this plant, and to enable us to give to the public satisfactory information respecting it. As we have often observed in the course of this work, any plant which will furnish a cheap food for our sheep will be a great blessing to our country.

From Dickson's Agriculture, vol. 2, page 837.

Burnet is a plant that may be cultivated for cattle, but its principal use is for sheep pasturage, it succeeds on most sorts of soils, as those of the sandy, clayey and peaty kinds, it is asserted to form a large proportion of the natural pasturage of extensive tracts on

the most fertile parts of the South Downs. Its most beneficial application is in the way of an early green feed for sheep or other stock. It should always be made use of in its young and tender state of growth, as being better relished. In soils that are fertile and suited to its cultivation it is said, under proper management, to afford good pasturage in the latter end of January and through the whole of the two following months. The severe weather in winter affects it less than most other herbaceous plants, being so hardy as in some cases to vegetate in that season, when the weather is a little open. If not fed down, it may be cut at the above period as a green food. Its property of resisting the effects of drought in the summer season, is likewise a circumstance of much importance in its favour: it has also the quality of getting thicker and more close on the land by time. For the purpose of hay it is a plant that is said to afford a large produce, but requires to be cut rather early, to prevent its coarseness.

PAGE 1150.—Another crop for feeding sheep in the spring which is of particular merit is Burnet, an acre of it properly managed will at this season yield much more food than an acre of clover and ray grass. It should be four or five inches high in November and left so through the winter. Burnet has the singular quality of maintaining its green leaves through the winter, so that under deep snows, you find some luxuriance of vegetation—from November to February the crop will gain two or three inches in growth in young leaves, and then be ready for sheep—it will be better in March, and (if kept,) fit in April, not only for sheep, but horses, cows or any other stock.

BURNET.—*From Willich's Domestic Encyclopædia.*

Mr. Miller asserts in his Dictionary, that the burnet is left uneaten by cattle, when the grass around has been cropt to the roots; that in wet winters and in strong lands, the plants are of short duration; and that the produce is insufficient to tempt any person of skill, to engage in its culture.

Dr. Anderson in his Essays on Agriculture affirms, that the produce of Burnet is too small to be worth cultivating.

On the other hand we meet with several authorities by whom the upland Burnet is strongly recommended as proper food for

cattle, on account of its partaking of the nature of evergreens, and growing almost as quickly in winter as in summer.

For the first introduction of this plant, into arable fields, we are indebted to Bartholomew Rocque, a farmer of Walham Green, near London; who in March, 1761, sowed six pounds of the seed upon half an acre of ground, with a quarter of a peck of spring wheat; but the seed being very bad it came up but sparingly. Not discouraged by this failure, he sowed two other pounds in the beginning of June upon about six roods of ground which he mowed in the beginning of August, and at Michaelmas transplanted them on about twenty roods of ground, at the distance of one foot each way, taking care not to bury the heart. These crops bore two crops of seed in the following year; the first about the middle of June, and the second about the middle of September. In the second year also two crops of seed were produced. As it could not be cut after September, he let it stand till the next year, when it sheltered itself and grew very well through the winter, except during a hard frost, when it nevertheless remained green. In March it covered the ground and was fit to receive cattle. It may be mown three times in one summer just before it begins to flower. From six roods of ground he obtained 1150 pounds at the first cutting of the third year; and was enabled to sell, in autumn 1763, no less than three hundred bushels of the seed.

The next authority is that of the Rev. Davies Lambe, Rector of Ridley in Kent. He is persuaded that burnet will prove a great acquisition to husbandry as a winter pasture; because, as he says, it never blows or hoves *cattle* and will flourish upon poor, light sandy, stoney or chalky land. After the first year it will weed itself, and be kept clear at little or no expense.

Mr. W. Pitt, a respectable farmer of Pendeford, Staffordshire, when speaking of the culture of the upland Burnet, informs us that one of his neighbours has observed in it this valuable property as a meadow grass, that it preserves the hay from over heating in the stack; and that the hay of a meadow in his possession, which contains naturally a considerable portion of this grass, always comes from the stack of a fine, fresh, green colour, while his other hay, without this plant, was over heated and turned out quite brown.

Mr. Rocque's directions for the culture of Burnet are concisely as follows. 1. Although it flourishes on stoney and gravelly, as well as in strong lands free from water, yet it will succeed better on a dry soil, nor will it thrive on grounds newly broken up. 2. It may be sown in any of the summer months, and will appear above ground in eight or nine days. 3. The soil should be worked very fine with a harrow, and rolled; twelve pounds of seed are sown to an acre, when it should be slightly harrowed and rolled again. 4. The first year it must be kept very clean; and in the next it will become strong enough to choak all other grasses, for no drought stints it, and no frost destroys it. 5. If two horses are allowed to an acre, it will grow faster than they can eat it: the first crop purges them as effectually as the strongest physic; which is, however, the case only for three days. It is said to cure horses of the distemper called the *grease*, and sheep of the *rot*.

COMPARATIVE ADVANTAGE OF SOWING BROADCAST AND BY DRILL.

Dorchester, *September* 2, 1814.

SIR,

THE Massachusetts Agricultural Society having requested communications of experiments in agriculture, I take the liberty to transmit you the result of one I made this season in the culture of barley.

On the 18th April last, I took a piece of ground one hundred and thirty-four feet long, and fifty-six feet wide, one half of which I sowed with barley in the usual way of scattering the seed, and used six quarts, one pint and a half at the rate of two bushels and a half to the acre. The other half I laid out in drills six inches asunder, and instead of sowing the seed, I planted it; (each grain four inches apart,) and raked the ground over, so as to cover the seed about one half of an inch. I used three pints of seed which I had previously steeped thirty-six hours in brine, made with salt-petre, in the proportion of one ounce to two quarts of water. This I planted on the 23d of April;

five days after sowing the other; it came up in five days. The barley *sowed* did not make its appearance until the eighth day. There was soon a very visible difference; the barley *planted* being of a much deeper green colour, and the blades much ranker. On the first of August I mowed both pieces, and put the whole into the barn the same afternoon, taking particular care to keep the two parcels separate. There was about one third more straw of the barley planted, than of that sowed, and after thrashing and winnowing it carefully, there was a difference of seventeen quarts in the quantity of barley. That planted in rows produced three bushels and one quart. That sowed in the usual way, two bushels and a half. I weighed a bushel of each, and found a difference of eight and an half pounds. The barley planted in rows weighed fifty-five and an half pounds, and that sowed forty-seven pounds.

It appears from the result of this experiment, that less than half a bushel of seed planted in rows is sufficient for one acre of ground, and that it will produce nearly a quarter part more barley, than two bushels and a half sowed in the usual way of scattering the seed. By planting in rows six inches asunder, and the seed four inches apart in the rows, each grain will have a portion of earth to nourish it equal to twenty-four square inches superficial, and in depth, the whole staple of the land to that extent, or in proportion to the depth of the tillage; but in the present mode of sowing grain, the ground is but partially covered, there being frequently spaces of a foot square without any seed, and then a number of grains so close together, that the roots unite, and not having room to spread, nor sufficient earth to nourish them, they never come to their full-growth.

Much of the seed *sown* is destroyed by birds, for want of being properly covered; this evil will be prevented by *planting*.

I was induced, Sir, to make this experiment from reading in an English magazine, a communication from an eminent farmer in that country, wherein he sets forth the amazing advantage that would be the consequence of introducing this regular method of planting wheat, instead of the present random practice of sowing. He says, that two bushels and a half are the medium quantity of wheat sown on an acre of ground throughout England, and that two millions and a half acres is the medium quan-

tity of land annually employed in the culture of that grain, and that the saving of seed in the first instance, will be a saving of 644,500 quarters of wheat, amounting at the rate of forty shillings a quarter to £1,289,000, and yielding bread for 850,000 people, at one pound a day for each.

I am, &c.

THOMAS HEWES.

To the Recording Secretary.

....

Note. For the purpose of comparing the produce of turnips by the drill and broadcast husbandry, two gentlemen of Sussex, England, who had cultivated them to some extent, about the middle of November, measured a square rod on each of their farms, and the turnips thereon counted and weighed. The following was found to be the result:

By the drill, the rod produced one hundred and thirty turnips, measuring nine bushels, and weighing three hundred and ninety four pounds, eleven ounces; weight of the tops ninety-three pounds, twelve ounces. By the broadcast, the rod produced one hundred and thirty-five turnips, (in number five more than by the drill,) but measuring only six and a half bushels, and weighing two hundred and eighty four pounds; weight of the tops, fifty-seven pounds, twelve ounces. So that no less than six tons, eighteen cwt. twenty ounces of turnips will be raised on an acre of land by the drill more than by the broadcast system.

[*Selected.*]

PRACTICAL REMARKS ON THE MANAGEMENT OF THE DAIRY, PARTICULARLY IN RESPECT TO THE OBTAINING OF BUTTER.

[From Anderson's Recreations in Agriculture, &c.]

My idea respecting disquisitions on agriculture is, that nothing can be deemed perfect which can be rendered more so, and that this degree of perfection should be the object aimed at in every such disquisition. With this view, the circumstances that can

end to affect the particular department in question, so as to augment or diminish the amount of the produce, or to improve or deteriorate its quality, ought to be, as much as possible, adverted to, in order that those, who wish to improve by such disquisitions, may be directed not only how to act so as to derive the full benefit of all the knowledge that the writer himself proposes, but also that they may have their attention turned toward such unascertained circumstances, as would have a tendency still further to perfect, the practice in that department, were they known. Thus will they be able to go on with intelligence in every step of their progress, and be continually advancing, by ascertaining some facts that their experience shall enable them to discover. In taking a comprehensive survey of the business of the dairy with this view, we shall find that the subject naturally divides itself into many branches, which will best be considered in succession; the first that we shall take notice of, as being nearly connected with the subject treated in our last, is

First, The choice of cattle for the purpose of the dairy.

Here a question arises that has never yet, that I know of, undergone discussion. In consequence of the idea having so long prevailed, that all the varieties of cattle were originally derived from the same parent stock, it never was once suspected that these varieties could differ from each other in regard to great characteristical distinctions. It was, for example, generally believed, that all sheep carried wool of some kind or other, unless in as far as, (according to a vague notion that prevailed respecting the influence of climate,) it had been affected by the climate. It has now been proved that this notion is erroneous, and that in the same climate, and in the same field, may be kept sheep bearing fine wool, coarse wool, long hair, short hair, and many other diversities and different mixtures of hair and wool, for their whole life, and still retain the original characteristic differences. In like manner it was believed, that no kinds of cattle existed which carried a coat that could in any degree be compared to a fleece of wool; and it was also supposed, that the size of cattle necessarily depended on the scarcity or the abundance of their food, especially while young. These also have been proved to be equally erroneous with the former opinion. It was also in general conceived, that the greater or less delicacy of meat

the same denomination, such as beef or mutton, depended chiefly on the kind of feeding which the animal had had, sometimes in connexion with the age of the creature ; but it was not suspected, that a great diversity in this particular might arise from the nature of the breed. In like manner it was known that some cattle gave more or less milk, and of a quality in proportion to their size richer or poorer ; but it does not as yet seem to be imagined, that different breeds may yield milk which possesses qualities extremely different from each other, though I see very great reason to believe that this may actually be the case ; and that, therefore, it behoves us to be on our guard, and carefully to attend to this particular. We know that the milk of those breeds of sheep, usually reared in this country, differs very much from that of our common cows for many economical purposes. Ewes milk, for example, though fully as thick as that from cows, yields very little cream, and that cream gives butter of a quality greatly inferior to what is obtained from the milk of cows. But on the other hand, the same measure of ewes milk will give more than double the quantity of curd that our cows' milk affords. Goats' milk, if my information be right, give still less cream, and scarcely any butter, but a very large proportion of cheese and little whey. Hence, for the purpose of the dairy, ewes milk can be much more profitably applied to making cheese than butter ; and the same may be said of goats' milk. Hence also it happens, that cheese is the principal produce of the dairy in Switzerland and other mountainous countries best adapted for the pasturage of goats ; while in the Netherlands, Holland, and similar rich flat countries, butter is the staple article obtained from the milk,

I state this merely to show, that the qualities of milk may vary greatly for certain economical purposes, when that variation is not obviously indicated by its external appearance. It therefore behoves us to keep this circumstance continually in our eye in all our researches concerniug the choice of cattle for the purposes of the dairy ; as it is by no means certain that some breeds may not give milk, that may much more nearly approach the nature of that of ewes or goats than others. To shew the benefit that may sometimes be derived from this kind of attention, I shall beg leave to state an accidental experiment which

brought a circumstance of this kind to light, where it was not in the smallest degree suspected. A friend of mine, who kept only a single cow for the use of his own family, bought in one, (from a person who kept from fifteen to twenty cows, chiefly for the purpose of rearing calves, but in a subsidiary view for the dairy,) which was recommended as an excellent cow, that gave a large quantity of milk for her size, and that of a most excellent quality. This last was a circumstance of great consequence to my friend, who took care to taste the milk, and found it excellent, I believe, before the bargain was finally completed. But, although that milk was thick and rich to the taste, it could never be made to yield one bit of butter, though they tried every method that could be devised for that purpose; on which account he was obliged very soon to part with the cow. Now, it chanced that this cow had given milk for three seasons before she was sold, without its having been ever discovered or suspected that her milk did not give as much butter as that of any cow in the dairy.

This experiment proves, that there may be individual cows among a great number which yield milk that possesses qualities extremely different from those in general of that breed, although to the eye and taste it appears not to differ from them at all; and therefore it behoves every person who wishes to conduct this business with a proper degree of attention and economy, always to ascertain the qualities of the milk of every cow individually, as soon as she is turned into the dairy; otherwise he may, like the person to whom this cow originally belonged, be going on for years together, and never know that he is subjecting himself to a great expense daily, without drawing any return for it. Innumerable other benefits will be found to result from the practice of keeping each cow's milk separate as much as possible, and examining it individually very often; for not only may the milk of one cow be, upon the whole, of a much inferior quality to that of another, and yield a much poorer return, which might thus be discovered, but it may also so happen that from casual disease, or other circumstances, the milk of one cow may become tainted at a particular time with a peculiar taste or other quality which may greatly injure the whole stock if it be mixed with it, and occasion losses to the owner, which by this caution might be

avoided; besides, he will thus avoid the danger of being induced, with that hasty decisiveness so common in rural affairs, to attribute the effects that arise from this unsuspected source to other circumstances that have had no influence whatever upon it. From these considerations I should recommend it as an invariable practice in every dairy, to keep each cow's milk separate on the first day of every month, at least throughout the year, for the purpose of ascertaining the quantity and quality of the milk yielded by every one of them individually. Were this practice strictly adhered to, it would advance the practical knowledge of the dairy more in the space of one year, than can be done in the random mode of procedure, usually adopted in a century; because it would lay open to view innumerable circumstances of great importance to the welfare and prosperity of the owners that are not at present suspected, and that never can come to be generally known among this class of persons, unless something of the kind here advised shall be done. I shall have occasion to specify some of these circumstances in the sequel, that I know will be disregarded by many dairy owners, merely because they have never had an opportunity of remarking them. The case that gave occasion to this remark is a striking example; but there are many others equally unattended to, and which daily occur.

Of this nature I shall briefly beg leave to specify the following diversity, that daily occurs among different varieties of cattle without being sufficiently adverted to. Some kinds yield a very large quantity of milk soon after calving, which continues to flow for a short time in vast abundance; but this flush of milk lasts only for a short time, like a horse without bottom, who sets off at the beginning of a journey with surprising alacrity, but soon becomes jaded and tired, and must have rest or he will die. Others, like a horse of true mettle, set off with less speed, but continue to make an equal progress, as at first, for a long while; so some cows give nearly as much milk after having calved ten or twelve months, as during the first month after calving, if equally well fed.

In the second place this experiment proves that milk may be yielded by varieties of the same species of animal, which may differ as much from each other in some of their economical peculiarities, as the milk of our ewes differs from the milk of

our ordinary cows. It is well known, for example, that the small *Alderny* breed of cattle affords, beyond dispute, a milk that yields a greater proportion of butter, and that also of a richer quality, than the milk of any other breed of cows common in this country ; but I do not know whether it has ever been ascertained what are the comparative qualities of that milk in the production of cheese ; or the proportion of milk given by these cows in respect to their size and the quantity of food they consume when compared with others. It is, I believe, a very general opinion, that such milk as affords the richest butter will also necessarily produce the best cheese ; and *vice versa*. We have already shown that this is not a necessary consequence ; and therefore the fact requires to be proved before it is admitted. It has also been supposed that the milk which affords the greatest quantity of butyraceous or oily matter will necessarily afford the richest cheese ; by which word *richest* I suppose is meant that which is most pleasant to the palate, and that has most the appearance of butter when put to the fire. This fact also requires to be proved, which I think will not be an easy matter ; for I have seen cheeses made of milk only, which were richer and more mellow than others that were made entirely of cream. There are, doubtless, cheeses made from materials that have as little oily matter in them as the Suffolk cheeses, which have nothing of their horny hardness ; other circumstances tend to produce this effect.*

I shall only further remark on this subject, that different kinds of milk may also vary from each other in respect to the qualities of the residuum that remains after the separation of the butter and the cheese. But it is sufficient barely to bring this into view, without enlarging upon it ; for I am afraid of tiring the reader with these niceties, as they will, I fear, be deemed by many ; leaving these then for the present, I return to some other particulars that are so plain as to be within the reach of every dairy-owner in the kingdom.

* Among the causes of the toughness and hardness of cheeses, may be mentioned the bad regulation of the pressure of them in the cheese press.

It is well known, that among every kind of cattle in the kingdom, there are found individuals that give a much greater *quantity* of milk than others of an equal size: it is also known that there are some cows which give *richer* milk than others do. These two facts are universally recognised and admitted among all who concern themselves with dairies. It is also equally well known by them and by graziers, that there are some beasts which feed more kindly than others, and fatten sooner upon the same pastures: but it is not so universally recognised as a truth, that individuals may be found which give at the same time a great quantity of milk and that of the richest quality, and fatten as easily, and are as hardy in all respects as any others. This fact, however, I have already stated and I venture to state it once more as a truth; nothing afraid that it will ever be contradicted by experience, when the business of the dairy shall come to be conducted with the neccessary degree of accuracy and precision: to which I beg leave to add that these qualities, whenever they are found, are transmissible to the descendants of the beasts which possess them, among which descendants, by a proper degree of attention these valuable qualities may not only be prevented from degeneration, but may be kept on for an indefinite length of time in a state of progressive improvemennt. If it should chance that the statements I now give should be well founded, who can pretend to say what would be the difference in the total amount of the produce of the dairy throughout Great Britain, should the time ever arrive when attention to this article shall become universal? I shall not pretend to estimate it; but I have no hesitation in saying that the dairy produce would in this event be more than double; and all this, not only without augmenting the expense of the dairy; but even, in all probability, by diminishing it.

According to the present practice a dairy farmer, who relies in general upon the common market for a supply of stock, not only does not obtain the best cows with respect either to the quantity or the quality of the milk, or the kindly feeding of the beast, but the very refuse of all these; for who that has cows to dispose of will sell the best while he has others of inferior value that are to appearance in a market equally good, if he has any occasion for such himself? Were dairy farmers to breed their own cattle, universally, the case would be quickly changed: each

of these would find himself directly profited by the improvement of his breed, and this interest would awaken his perceptive faculties in a surprising degree.

General aphorisms respecting the management of milk in the dairy, for the purpose of obtaining butter.

In the management of a dairy, the following peculiarities respecting milk ought to be particularly adverted to : some of them are no doubt, known in part to attentive dairy owners ; but I have reason to believe that they have never yet been considered by any one with so much attention as their importance deserves ; and by many persons have perhaps never been thought of at all. I adopt the form of aphorisms that they may be the more readily adverted to and the easier remembered.

FIRST APHORISM.

Of the milk that is drawn from any cow at one time, that part which comes off at the first is always thinner, and of a much worse quality for the purpose of making butter, than that which comes afterward; and the richness goes on continually increasing to the very last drop that can be drawn from the udder at that time.

Few persons in the country are ignorant that the milk which is taken from the cow last of all at one milking is richer than the rest of the milk ; on which account a distinct name has been given to it in most parts of the country. In some places it is called *afterings*, because it is usually obtained when wanted for sick persons or other uses, by remilking the cow *after* the ordinary milking has been finished.—In other places it is called *stroakings*, because it does not come in so full a stream as in the ordinary course of milking ; and it is probably known by other names in other parts of the country. This circumstance sufficiently proves, that the difference in its quality has been adverted to ; but few perhaps are aware of the greatness of the disproportion between the quality of the first and the last drawn milk from the same cow at one milking. The following facts respecting this particular were ascertained by me many years ago, and have been confirmed by numberless subsequent experiments and observations.—Having taken several large tea cups exactly of the same size and shape, one of them was filled at the beginning of the milking of the cow, and the others at regular intervals till the

last, which was filled with the dregs of the stroakings. A counter weight being put in for each cup, they were individually weighed, so as to ascertain with precision that the same quantity of milk was contained in each cup. From a great number of experiments frequently repeated with many different cows, the result was in all cases thus :

The quantity of cream obtained from the first drawn cup was *in every case*, much smaller than from that which was last drawn ; and those between afforded less or more as they were nearer the beginning or the end. It is unnecessary here to enter into the minute details of these intermediate proportions ; but it is proper the reader should be informed, that the quantity of cream obtained from the last drawn cup, *from some cows*, exceeded that from the first in the proportion of *sixteen* to *one*. In other cows, however, and under particular circumstances, the disproportion was not quite so great ; but in no case did I find it fall short of the ratio of *eight* to *one*. Probably, upon an average of a great many cows, it might be found to run at the ratio of *ten* or *twelve* to *one*.

The circumstance that chiefly occasioned a variation in regard to these proportions was the nearness or distance from the time of calving ; for in all cases the milk of the same cow was thinner immediately after calving than at a greater distance from it ; the disproportion between the first and last drawn was also much greater soon after calving than at a more distant period. As the flush of milk occasioned by that incident abated, it became in general thicker and more uniform in its quality, so that if within a fortnight after calving the proportion of cream from the first and last drawn cups were as *sixteen* to *one*, it is probable that at the end of six or nine months the disproportion in that cow's milk would not be more than as *ten* or *twelve* to *one*.

But these variations do not take place in the same proportion in every cow ; on the contrary the milk of some cows varies more in this respect than that of others ; depending on the nature of the breed and other circumstances peculiar to the individual.

But if the difference in the *quantity* of the cream obtained at the beginning and at the end of the milking be great, the variation in the point of the *quality* of that cream is still greater.

In the first drawn cup, especially when the difference in the quantity was very great, the cream upon it was only a thin tough film, thinner and perhaps whiter than the paper on which I write ;

in the last drawn cup, it was of a thick butyraceous consistence, and of a glowing richness of colour, that no other kind of cream is ever found to possess.

The difference in the quality of the *milk* that remained after the cream was separated, was perhaps still greater than what respects either the quantity or the quality of the cream. The milk in the first drawn cup was a thin bluish liquid, appearing as if a very large proportion of water had been blended with ordinary milk; that in the last drawn cup was of a thick consistence, yellow colour, and rich taste, more resembling cream than milk in all respects, only sweeter to the taste, and less oily upon the palate.

From this experiment it appears, that the person who by bad milking of his cows, loses a little milk, loses more than is usually suspected; for if he leaves behind only half a pint of milk that might have been obtained, he loses, in fact, as much cream as would have been yielded by about six or eight pints of milk at the beginning, and loses, besides, that portion of the cream which alone can give richness and high flavour to his butter.

SECOND APHORISM.

If milk be put into a dish and allowed to stand till it throws up cream, that portion of cream which rises first to the surface is richer in quality, and greater in quantity, than what rises in a second equal portion of time; and the cream that rises in the second interval of time is greater in quantity and richer in quality, than what rises in a third equal space of time; and that of the third than the fourth, and so on; the cream that rises decreases in quantity and declines in quality continually, as any rises to the surface.

My experiments in this case not having been made with so much accuracy as in the former, I have not been able to ascertain the difference in the proportion that takes place in equal portions of time; but they have been so often repeated as not to leave any room to doubt the fact; and it will be allowed to be a fact of no small importance in the management of the dairy. It is not certain, however, but that a greater *quantity* of cream, on the whole, may be obtained from the milk by taking it away at different times, but the process is so troublesome as not to be counterbalanced by the increased quantity obtained, if indeed any additional quantity be thus obtained, which is not as yet fully ascertained.

But where the *quality* of the butter is the principal object aimed at, it may be greatly improved by duly attending to this peculiarity.

THIRD APHORISM.

Thick milk always throws up a much smaller proportion of the cream that it actually contains than milk that is thinner, but that cream is of a richer quality; and if water be added to that thick milk, it will afford a considerably greater quantity of cream, and consequently more butter, than it would have done, if allowed to remain pure; but its quality is at the same time greatly debased.

This is a fact that every person attentive to a dairy must have remarked; but I have never heard of any experiment that could ascertain either the precise amount of the increased quantity of cream that might be thus obtained or of the ratio in the decrease of its quality, but it ascertains at least the effect of mixing water with the milk in a dairy; and the knowledge of this fact will enable attentive persons to follow that practice which they shall find will best promote their own interest.

FOURTH APHORISM.

Milk which is put into a pail or other proper vessel, and is carried in it to a considerable distance, so as to be much agitated, and in part cooled before it is put into the milk pans to settle for cream, never throws up either so much or so rich cream, as if the same milk had been put into the milk pans directly after it was milked.

In this case, it is believed, that the loss of cream will be nearly in proportion to the time that has elapsed, and the agitation it has sustained after it has been drawn from the cow.

From these fundamental facts respecting the dairy, many very important corollaries serving to direct the practice may be deduced; among which we shall only stop to take notice of the following.

First. It is evidently of much importance, that the cows should be always milked as near to the dairy as possible, to prevent the necessity of carrying and cooling the milk before it be put into the dishes.

Second. The practice of putting the milk of all the cows of a large dairy into one vessel, as it is milked, there to remain till the whole milking be finished, before any part of it is put into the milk pans, seems to be highly injudicious, not only on account of the loss which is sustained by agitation and cooling, but also and

more especially because it prevents the owner of the dairy from distinguishing the good from the bad cow's milk, so as to enlighten his judgment respecting the profit that he may derive from each. Without this precaution, he may have the whole of his dairy produce greatly debased by the milk of one bad cow, for years together without being able to discover it, as I have had an opportunity to illustrate in another part of this work.

Third. If it be intended to make *butter* of a very *fine quality*, it will be advisable not only to reject entirely the milk of all those cows which yield cream of a bad quality, but also in every case to keep the milk that is first drawn from the cow, at each milking entirely separate from that which is got last; as it is obvious, if this be not done, the quality of the butter must be greatly debased, without much augmenting its quantity. It is also obvious that the quality of the butter will be improved in proportion to the smallness of the last drawn milk that is retained; so that those who wish to be singularly nice in this respect, will do well to retain a very small proportion only of the last drawn milk.

Although I do not mean in this essay to enter professedly on the dairy management for the purpose of making cheese, it is necessary, for the purpose here stated, and other considerations that will occur, to suggest a few hints on that head, so nearly connected with the object of our present discussion. It will be found, when it comes to be investigated, that the reasoning usually adopted on this subject is in many respects erroneons. It is, for example, very generally supposed, that the goodness of cheese depends altogether upon its *richness;* by which is meant, the proportion of oily matter, whether natural or adventitious, that it contains; nothing however is more certain than that this is not the case. If the *sapor*, the pleasant relish to the taste, be adopted as the rule for ascertaining excellence, nothing can be more certain, than that this does not depend on this circumstance. *Parmesan* cheese is in general deemed in respect to *sapor* among the best kinds of cheese that are made; but contains no remarkable proportion of oily matter. To many palates, the small round Dutch cheeses are very pleasing to the taste, yet these are made entirely of skimmed milk.

If softness to the feel, and that kind of consistency which appears mellow and butyraceous, be the rule for ascertaining the *richness* of cheese, neither will this be found to depend necessarily

upon the proportion of oily matter they contain. I have seen cheeses made of skimmed milk, that ate exactly like the finest kind of cream cheese, which approaches to the taste and consistency of butter ; and I have seen cheeses made entirely of cream, which had much less of that buttery taste and appearance than the other. In short, much more depends upon the skill and dexterity of the operator, than on the quality of the materials. Many cheeses are made in England of as rich milk as the Stilton cheeses, which seem not to contain nearly the same proportion of cream ; and I had lately occasion to notice that a great many cheeses are made of the same kind of milk with the Suffolk cheeses, which have nothing of that horny hardness and indigestible quality for which these are remarkable.

From these facts, and many other considerations, I am satisfied that what we call the richness of cheese depends more upon the particular process adopted in the management, than upon the materials of which the cheeses consist. The taste of Gloucester and that of Cheshire cheeses are very different from each other, though the quality of the milk of which they are made varies very little. The same thing may be said of Stilton and Parmesan cheeses, though the vanity of man, desirous to conceal his own weakness, is forever disposed to attribute these peculiarities to soil or pasture, or other circumstances that seem to throw the blame from off his own shoulders. It is even so with regard to butter also, the excellence of which in every district where fine butter is made, is universally attributed to the richness of the pastures, though it is a fact well known, that take a skilful dairy maid from that district into another where no good butter is usually made, and where, of course the pastures are deemed very unfavourable, she will make butter as good as she used to do ; and bring one from this last district to the other, and she will find that she cannot make better butter there than she did before, unless she take lessons from the servants or others whom she finds there. I have frequently known instances of this kind. The same takes place in the manufacture of beer. From the very same malt put into the hands of a dozen of brewers in different districts, you shall have as many kinds of beer, totally distinct from each other ; and, perhaps, no verbal instructions could enable one of these persons at first to make, of that malt beer of a similar sort to that of the other. In matters of this

sort a very great diversity is produced by circumstances apparently of the most trivial kind.

Respecting the management of milk for the obtaining of cheese, I beg leave further to suggest the following particular as a proper object of inquiry and experiment, viz. whether the quantity of caseous matter afforded by milk be necessarily connected with the proportion of cream which that milk contains, or whether it depends upon some other principle not hitherto investigated? Without pretending to decide on this question, I feel myself strongly inclined to believe, that it does not depend upon the quantity of cream. It is well known that cows' milk, which always throws up more cream, and that of a much richer quality than ewes' milk, and still more so than goats' milk, does in no case afford half the proportion of cheese that either ewes' milk or goats' milk affords. Nor can this singular tendency of ewes' milk to yield a greater proportion of curd be attributed to its superior thickness; for the milk of particular cows may sometimes be had, that is richer and thicker than ewes' milk, but it always affords a much smaller proportion of curd. It is also well known that skimmed milk yields nearly, if not entirely, as much cheese as the same quantity of the same cow's milk does when the cream has not been separated from it. In short cream, or the oily portion of the milk, seems not to be convertible into curd at all; a portion of it only is entangled among the curd, while another portion of it is carried off with the scum or whey, from which it may be afterwards recovered in the form of butter, and it is well known in many countries by the name of whey-butter. That butter is, indeed, of a quality much inferior to butter obtained from cream, but this may be occasioned by the particular circumstances in the process for making cheese; and it is by no means impossible, that by attending to the process with a view to this particular, the quality of that whey-butter may be much improved. In short, it appears to me that the *caseous* and *butyraceous* parts of the milk are totally distinct from each other, and may be obtained separately, without much affecting the *quantity* of each, or even perhaps the qualities of either, were the dairy process sufficiently understood.

Fourth. If the *quality* of the butter be the principal object attended to, it will be necessary not only to separate the first from the last drawn milk, but also to take nothing but the cream that

is *first* separated from the best milk; as it is this first rising cream that is of the prime quality. The remainder of the milk which will be still sweet, may be either employed for the purpose of making sweet milk cheeses, or may be allowed to stand to throw up cream for making butter of an inferior quality, as circumstances may direct.

Fifth. From the above facts we are enabled to perceive, that butter of the very *finest* quality can only be obtained from a dairy of considerable extent, when judiciously managed; for, when only a very small proportion of each cow's milk can be set apart for throwing up cream, and when only a very small proportion of that cream can be reserved as of prime quality, it follows, that unless the quantity of milk were, on the whole, very considerable, the quantity of prime cream produced would be so small as to be scarcely worth the while for manufacturing separately.

Sixth. From these premises, we are led to draw a conclusion extremely different from the opinion that is commonly entertained on this subject, viz. that it seems probable that the very best butter could only be with economy made in those dairies where the making of cheese is the principal object. The reasons are obvious:—If only a small portion of the milk ought to be set apart for butter, all the rest may be made into cheese while the milk is yet warm from the cow, and perfectly sweet; and if only that portion of cream which rises during the first three or four hours after milking is to be reserved for butter, the *rich* milk which is left after that cream is separated, being still nearly quite sweet, may be converted into cheese with as great advantage nearly as the newly drawn milk itself.

Nor does what I here observe tend to invalidate the justness of the commonly received opinion upon this subject, which will in general be just, according to the usual practice of dairy owners in any part of Britain; under whose system of management the making of good butter and good cheese in the same dairy is impracticable. For, where the whole milk is set apart for separating cream, and the whole of the cream is separated, the milk must of necessity be turned sour before it is made into cheese; and I believe that no best cheese can be made from milk that has once attained that state.

It is not, I believe, generally known, that the spontaneous separation of cream and the production of butter is never effected

but in consequence of the production of acid in the milk; and the formation of that acid is accelerated by the separation of fixed air, or, as it is now called, carbonic acid air, from the milk, which is accelerated or retarded by circumstances not usually adverted to. This fact I had occasion to discover during a course of experiments on milk that I made a great many years ago, and that I have above alluded to; which was occasioned by the following circumstances. Having remarked, that of two tea-cups, which contained milk that I knew to be of the same quality by previous experiments, one had the cream upon it at one time of a consistence different from the other; and being at a loss to account for this variation, I tasted the milk in each of the tea-cups and found one of them sensibly more acid than the other. A piece of newly slaked lime having been accidentally nearer to one of the cups than to the other, I began to suspect that it might be occasioned by this circumstance. With a view to ascertain this fact, I immediately caused two tea-cups to be filled with equal quantities of the same milk, and immersed one of the tea-cups up to the brim in a quantity of quick lime that had been so long slaked as to have acquired the same temperature with the air, but was not yet become nearly *effete;* the other tea-cup was placed in the same apartment, at the distance of about a yard from the former. The result was that in the course of twelve hours the milk in the tea-cup placed among the lime tasted so sensibly sourer than the other, that of near a dozen of persons who were desired to taste them, without knowing for what purpose, every one of them pronounced it incontestibly the sourest. The cream also was more perfectly separated from it than the other. It is in consequence of the necessity there is for the forming of acid in the milk, in the process of making butter, that when fanciful people attempt to churn milk newly drawn from the cow, the operation must be continued until this acid be generated, and of course the churning must be protracted much longer than would have been necessary under other circumstances, and this always tends to impair the quality of the butter. Now, as nothing tends so much to impair the quality of cheese as acidity in the milk from which it is made, it must follow that when cream is separated from it *in the usual way* for making butter, the milk must have attained such a degree of acidity as to prove highly detrimental. It must, therefore, be a

destructive practice to make butter in a cheese dairy after the usual manner; but not so in regard to the practice above recommended.

For the ordinary market, I am satisfied, from experience and attentive observation, that if, in general, about half the milk be separated at each milking, and the remainder only be set up for producing cream, and if that milk be allowed to stand to throw up the whole of its cream, even till the milk tastes perceptibly sourish, and if that cream be afterwards carefully managed, the butter thus obtained will be of a quality greatly superior to what can be usually obtained at market, and its quantity not considerably less than if the whole of the milk had been set apart for producing cream. This, therefore, is the practice I should recommend, as most likely to suit the frugal farmer; as his butter, though of a superior quality, could be afforded at a price that would always insure it a rapid sale.

Another advantage would result from this practice, which might in some cases prove highly beneficial: for thus, it is probable, might some particular tastes of milk, that at times affect it and greatly deteriorate the butter, be entirely got rid of, as will appear from the following experiment:—

In the course of the set of experiments on milk above alluded to, I perceived that the milk from one cow tasted exactly as if salt had been put into it. Upon inquiry respecting the cause of this peculiarity, I was informed that the cow in question had missed calf that season, and was still continued in milk over the whole year, and I was farther told, that a salt taste was very frequently perceptible in milk of this kind. Having tasted however some of the last drawn milk, I found it was perfectly sweet, and that the milk of the first drawn cup was excessively salt. This particular strongly roused my attention; and with a view to discover how much of the milk was affected with that salt taste, I caused the whole of the milk to be drawn from the cow into tea-cups, one after the other; and having examined them in the order they were drawn, I found that the first cup was the saltest of any, and that this taste gradually abated in each succeeding cup till about the middle, where it totally disappeared. It is probable, that the nauseous taste from cabbages, turnips, garlic, &c. may affect the milk after the same manner; but other avocations prevented me from bringing it to the test of experiment.

I shall leave this part of the subject, barely mentioning the principal ingredients of milk :—And *first*, It contains an oily matter which may be separated in the form of cream or butter.

Second, A caseous matter which may be separated in the form of curd or cheese.

Third, A saccharine matter, which has never yet been exhibited in its concrete state, because of the rapidity with which in its dilated state, it always rushes forward into the acetous fermentation ; and

Fourth, A serous or watery part, which probably is nothing else than pure water impregnated with some of the other ingredients. This is separated in the form of whey and a thin and almost colourless liquor obtained from sour milk.

ON THE TALL OAT-GRASS.

[From Nicholson's Journal, September, 1812.]

The tall oat-grass, *avena elatior*, grows and produces an abundance of fodder, both in good and bad soils. It is of very early growth, and rises to the height of from two to three feet. Its stalk is fine and slender, and makes very good hay. It is mowed twice a year. If it be eaten green it may be cut oftener, but it is principally cut for hay.

It may be sowed in autumn or in spring, after two ploughings ; at the rate of seventy kilderkins, (one hundred fifty-four pounds) to the half *acre*. Frequently saint-foin is sown with it, in the proportion of a hectolitre, (two bushels and three pecks,) of saintfoin and sixty kilderkins, (one hundred thirty two pounds of oat-grass seed to the above quantity of ground.)

It is particularly adapted to horses ; but all animals that are commonly fed with hay, eat it with pleasure. Opinions have been so divided respecting this plant, that while several writers have been eager to boast its advantages, others have endeavoured to depreciate it. This difference of opinion respecting a plant of real utility, has risen from the authors who have mentioned it omitting its botanical name. Hence some have confounded it with the ray grass, *lolium perenne ;* others with the *way ben-*

net, *hordeum murale*, which has no relation to it, and is one of the very numerous plants injurious to meadows.

I repeat, that the *avena elatior* is the best basis of a natural meadow; and that when cultivated alone it makes an excellent pasture. It is one of the best of the family of grasses, as any one may readily be convinced by observation. It may be known any where by its tender stalk rising above the other grasses, and terminating in pannicles a little drooping.

WHEAT CROPS.

During the last thirty years, few attempts have been made to raise wheat in parts adjacent to the sea coast of Massachusetts proper, and a belief has generally prevailed that no species of this valuable grain could be made to thrive there. As there appeared no other local cause of sufficient importance to account for the failure of the experiments, it was supposed to be owing to some peculiarity in the climate. Since, however, the late more successful attempts of which we now give some account, it is much to be doubted whether we have any reason to complain of our climate in this particular, and may flatter ourselves with raising as good average crops of wheat for the time to come, as are produced in any part of the United States; taking care always to select the proper seed.

From a late communication to the Board of Agriculture in England, it would seem that the crops of winter wheat and some other species have been so often blighted or mildewed as to have occasioned a belief of a change in the climate of that country, and induced many respectable farmers to abandon the raising of wheat altogether. Having ourselves so recently made the discovery, as it is hoped, that the difficulty experienced in raising wheat in this state has been owing more to the qualities of the particular seed employed, than to any thing in the climate unfavourable to wheat crops generally, our attention was the more readily engaged by a paper, the principal object of which is to show, that in order to continue the successful culture of wheat in England, recourse must be had to seed of a species different from any heretofore cultivated among the wheat growers in general.

Mr. Skurray, the author of the communication alluded to, makes known a species of wheat which he and others have cultivated with complete success, on lands in which the winter wheat and some species of spring wheat have wholly failed.

From the description given of this wheat, it is not improbable it may be the same with some of the species which have been raised so successfully, of late years, in the eastern states. The publication of Mr. Skurray's letter here, may induce some gentlemen to send to England for the seed.

We have spoken of the successful culture of some species of spring or summer wheat, and subjoin several letters on the subject from our correspondents. It will be observed that we have been cautious in not giving a name to the wheat lately raised in this vicinity. It is because we think its history is not yet understood. It is generally supposed, that it was introduced into Massachusetts from Londonderry, in New-Hampshire, but where or how it was procured by the people of Londonderry we have not heard. Our uncertainty on this subject has been increased by the subjoined letters of Bezaliel Taft, jr. Esq. and John Jenks, Esq. both of whom procured their wheat at first from Vermont. It would be very desirable to gain some further knowledge of the history of the spring wheat cultivated here, and whether there are more than one species.

ON THE CULTURE OF THE REAL SUMMER WHEAT.

By CHARLES T. SKURRAY, *Esq. of Devonshire, England.*

[From Translations of the Board of Agriculture.]

It has happened rather unfortunately that the many varieties of wheat which have been cultivated in the spring, and thence denominated spring wheats, have proved of a very inferior quality, and the growers have, in consequence, been obliged to sell it at a lower rate than other wheat. This has occasioned so great a dislike to every kind of wheat sown in spring, that it has become a very difficult matter to prevail on a mere practical farmer to sow his land with spring wheat, even if his crop of winter wheat has been destroyed by severe weather, and the numberless acci-

dents to which it is always exposed; he rather prefers sowing his wheat land with either barley, oats or pulse;—of course this system must be productive of an extra quantity of barley, &c. and occasion a great deficiency of bread corn; for wheat must be considered as the food of *four fifths* of the inhabitants of England and Wales. And when there is a failure in our harvest we are under the necessity of importing any deficiency of wheat from foreign countries. The climate of Great Britain has of late years been very unfavorable to the growth of wheat, and it is easy to trace the present high price of grain to this much to be lamented cause. The distempers to which wheat has for many seasons past been liable, are known by the name of blight and mildew. Many farms are now become so subject to one or other of these misfortunes, as to induce the occupiers to abandon the culture of wheat altogether, and numerous instances have occurred within the knowledge of the writer where farmers of substance and respectability have been utterly ruined by the failure of their wheat crops from the above causes.

It will therefore be my endeavour to convince the most prejudiced mind, that the valuable grain, of which I am now treating, is wholly exempt from the mildew in those seasons when common wheat is completely destroyed by it; that it is of superior value to the miller, to the consumer, and to the farmer; that it produces a large return; and is on the whole more profitable than any other corn crop.

Before I proceed to detail the method of culture, I shall briefly state some of the great advantages to be derived from the summer wheat.

First. It may be sown with success the beginning of May.

Secondly. It is the best of all corn as a nurse to clovers and other grasses.

Thirdly. It requires no extraordinary tillage or manure.

Fourthly. It produces a large increase, and is very much approved of by the millers.

Fifthly. The straw makes excellent fodder for cattle.

Sixthly. It is not liable either to rust, mildew or blight and in wet seasons is not apt, as common wheat, to lodge or go down.

After many years experience, I can with confidence assert, that there is no other species of wheat which possesses these important advantages.

Having made these observations, merely to point out the advantages to be derived from it, I shall now proceed to the method of culture.

First. *The description of the grain.* The real summer wheat is somewhat different in its external appearance from that sort usually called spring wheat. It is a small plump grain of a brownish cast; the bran remarkably thin, very heavy, but not what the millers term a bright sample; it has a bearded ear generally; but I suspect this depends greatly on the land, as some soils produce more and longer beards than others, while in some places the beards will in time nearly disappear;—this is a fact I am totally unable to account for. The straw is slender, but never grows very high.

The soil. A tenacious loam suits it well, but any soil that is not too light will yield a crop, provided it is clean, in tolerable heart, and well worked. Wet boggy land wholly improper. The lands in the north of Devon are shallow, light, and rocky; of course not adapted for a wheat crop. The average crop of wheat in that part of the country is about fifteen bushels per acre. The summer wheat has generally produced from twenty-five to thirty bushels in the same land; soil and seasons alike.

The rotation. After turnips, potatoes, cabbages, or any green crop; but where the winter wheat may have failed from any cause whatever, the summer wheat is always sure to succeed I have known it succeed well when a coarse old pasture had been pared and burnt and sown with turnips, the turnips fed off, and summer wheat sown the end of April.

Seed and preparation. About three bushels per acre is the proper quantity, as it has not time to spread so much as winter wheat; but if the land is rich a less quantity of seed will suffice; though under any circumstances less than ten pecks should not be sown. The seed must be prepared with lime and brine in the ordinary way that other seed wheat is; for let it be remembered, that it is fully as liable to smut as common wheat without this salutary and wise precaution. The proper time for sowing is all April sooner or later according to the season.

Harvest. It ripens about the same time as other wheat; thus in four months after sowing, it is harvested; with other wheat, ten months, and in some cases nearly one year is necessary to bring it to perfection. Being short in the straw, it may be mown

with a scythe and bow, like barley; it is thus cut speedily, and at little expense.

Produce. In the west of England where the wheat crops are light compared with other counties, the produce of this wheat is generally ten bushels per acre more than common wheat, even when sown in the same field. The weight of a bushel, Winchester measure, in 1811, was 60¾ pounds; but this was a year when all grain was particularly light. In some cases the writer has had it full 61¼ pounds the Winchester bushel.

The comparative value of summer wheat may be stated as one shilling per bushel above the market price of the best red *Lammas* wheat; in some instances the writer has known it sold to the millers two shillings per bushel more than common white wheat.

But hitherto, in consequence of the growers reserving their summer wheat for seed, (and which I have taken much pains to persuade them to do) but little has been sold to the millers, and that only to ascertain its real value as bread corn. After having proved the quality they would have purchased any quantity of it.

The bread made from it possesses many good qualities, it remains moist long after it is baked; it rises well in the oven, and is very pleasant to the taste. It is supposed by some eminent chemists to contain more gluten or nourishment, than common wheat; it is not, however, so white as bread made from the flour of white wheat. On referring to Duhamel's Elements of Agriculture, I find it there stated, that this species of grain (which he calls summer wheat) has been cultivated in France for a series of years, and the only objection to it appears to be that the work in the spring would be too much hurried by having all the corn to sow at that season.

This, I admit, may, at the first blush, appear an objection, but after due consideration it will not be so formidable as some agriculturalists seem to imagine. The tedious part of the operation in preparing land is ploughing and manuring; therefore if the winter months are employed in ploughing and carting out manure, &c. the process of sowing and covering the seed may be dispatched, when the proper season arrives, without any extra bustle or inconvenience. And instead of committing the seed into a bed of mire in the months of November and December, the lands may be previously laid up in due form to be ready to work the first dry time after the turn of Christmas.

It is much to be apprehended that the late wet autumn has obliged much land to be sown in a wretched condition, and much more to remain unsown to this day. In this case the dependance of the farmer must be on the common wheat sown in the spring, which, I know by experience is but a sorry dependance. Being sown late it of course ripens late, and has to encounter all the risks of blight and mildew. Should it chance to escape these maladies, the short days commence, the sun loses its power, and the rainy weather sets in before the corn is sufficiently ripe to harvest. The loss to the farmer and to the nation is obvious.

In such instances the advantages of the summer wheat must appear conspicuous, and those who had once felt the benefit of it would act unwisely to omit sowing it every year, at least in sufficient quantity to furnish seed to their neighbours and themselves ; the great difficulty of procuring that which is really good and genuine, being a strong barrier to its introduction. This wheat came into Devonshire many years ago from either France or Guernsey, and was grown more for curiosity than any other motive. It was in the hands of a few gentlemen only, when my neighbour, the late Mr. Exeter, whose practice in the drill husbandry is so well known, procured a bushel of it for experiment sake. Not being acquainted with its nature, he sowed it at too early a period in the spring, (February and March) when the produce and sample did not meet his approbation the ensuing harvest. He, however, sold small parcels of it to his neighbours, none of whom paid any attention to its peculiar merit. Meeting with a few bushels, in the hands of a farmer, I purchased them, and after repeated experiments I found it a most valuable grain. So conscious now are the farmers in Devonshire of its merits, that it is bought up with avidity in the markets at a very high rate for seed; though previous to my cultivating it on a large scale, the value of it was unknown, both to the farmers and the millers. Within a few years I have grown many hundreds of bushels which I have taken pains to disseminate. Many persons who obtained small quantities of the seed to make trial, have invariably continued the culture of it on an enlarged scale, and there is no single instance, in which it has been fairly tried, that it has failed to answer the expectations of the grower.

Certificates from various individuals who have grown this valuable wheat were forwarded to the London Society of Arts, with some communications from me on the subject, for which I was complimented with an honorary medal.

COMMUNICATION FROM JOHN LOWELL, ESQ. ON WHEAT.

[To the Trustees of Massachusetts Agricultural Society.]

Roxbury, November 20, 1814.

GENTLEMEN,

A WISH having been expressed by the Trustees last spring, in consequence of the successful experiment of Mr. Dudley Hardy upon the culture of wheat in Brighton, (an account of which was published in our Journal last winter,) that many experiments of the same kind should be repeated in different towns near the sea coast and on different soils, I was induced among others to make a trial of this wheat, and although it was made upon a small scale, it was not the less satisfactory.

I had but one small piece of ground in a proper state to receive wheat. It measured one third of an acre. The soil was very thin over a bed of gravel, extremely subject to drought and incapable, as I thought, of bearing a large crop of any sort. Potatoes had been cultivated on it for two years preceding. It had been twice ploughed the fall before, after the potatoes were dug. In the spring four horse cart loads of horse dung were spread upon it and ploughed in. On the seventh day of April, I sowed upon it three quarters of a bushel of Mr. Hardy's wheat. This wheat was of small size and rather shrivelled. It is said to be the same known and cultivated as Londonderry wheat.

The crop looked extremely well, none of it was blighted, and on the second of August it was reaped. The produce was precisely seven bushels and an half. It weighed from fifty-six to fifty-eight pounds the bushel. The same land was again ploughed on the seventh of August, and a crop of clover sown on it. Its appearance is now very good.

Your humble servant,

J. LOWELL.

LETTER FROM HON. J. QUINCY.—*SAME SUBJECT.*

Boston, December 21, 1814.

SIR,

I STATE, in conformity with the wishes of the Agricultural Society, the result of a small experiment made the last season on spring wheat, obtained from Gorham Parsons, Esq. of Brighton.

In March, as soon as the frost would permit, I ploughed a measured acre; carted on about ten loads of manure, the usual quantity for a barley crop; steeped one bushel of wheat in the drainings of a common heap; sowed and harrowed it into the ground.

The product was fifteen bushels of good wheat.

No blast or smut was perceived on the wheat. It weighed sixty pounds to the bushel.

Some stalks of rye having sprung up with the wheat, I examined them and found every head blasted.

My land adjoined the bay, and was a clayey loam.

Respectfully,
I am your obedient servant,
JOSIAH QUINCY.

To the Corresponding Secretary.

FROM HON. P. C. BROOKS.—*SAME SUBJECT.*

Medford, November 26, 1814.

DEAR SIR,

I ATTEMPTED this year to raise the spring wheat. I had a bushel of seed from Brighton. After having it soaked twenty-four hours in ashes-ley, it was sown on an acre of ground on which Indian corn had been planted for two years. The land was prepared as it is commonly done for barley and grass-seed. On the first day of August the wheat was reaped, and soon after threshed; but though the kernel was plump, and the weight sixty-four pounds the bushel, yet the crop was very small. It did not exceed fourteen bushels. I feel confident, however, that

I should have had several bushels more if my field had not been injured by the charloc or wild turnip; and I am so much encouraged by the experiment, that I intend next year to try it again, in preference to barley.

I am, &c.

P. C. BROOKS.

FROM BEZALIEL TAFT, JR. ESQ.—*SAME SUBJECT.*

Uxbridge, November 19, 1814.

DEAR SIR,

I DID not observe your communication, in the Repertory, of the 22d ult. until within a few days, and embrace the first leisure moment to communicate such information, on the subject, to which you refer, as results from my own observation and the experience of my father and self.

Until within about fifteen years it was thought impracticable to raise wheat, in this town, on account of the blast which usually rendered the crop of little or no value. I presume for the first five, of the last twenty years, there were not five bushels raised annually in this town.

About fifteen years since, my father procured a bushel of spring wheat from Barry, on the Onion river, in the state of Vermont. The produce of that seed was such as to induce him to repeat the experiment; having threshed about fifteen bushels of good plump, full kernelled wheat, the increase of the one bushel sown.

He continued to procure his seed from the same place for several years, and attributed his success to that cause. But finding it attended with inconvenience to procure an annual supply from such a distance, we at length sowed the seed of our own growth; paying, however, more particular attention to the seed before committing it to the ground.

For the last ten years we have sown the seed of our own growth, preparing it in the following manner. We have, in the first place, washed the seed intended for sowing clean, stirring it well in two or three changes of water. Having washed the

grain, we have then soaked it about twelve hours, in what women, who make soap from ashes, call a weak ley. After turning off the ley we have stirred in about two quarts of slaked lime to one bushel of wheat.

The object of washing the seed is, to prevent smut, and we are confident it has that effect, as we have seldom seen a head injured in that way, since we adopted the above mode of preparing the seed. The benefit resulting from soaking in ley, is perhaps too obvious to mention. The kernel is swollen and vegetates sooner than it would if committed to the ground in a dry state. The advantage to be derived from the application of the lime is extremely similar. It adheres to the seed, forming a rich and pungent envelope, defending it from insects and producing a vigorous blade ; bringing it to maturity before the cold commences, which we frequently experience early in August.

We have invariably selected for the cultivation of wheat, such ground as would be the most sure of producing a good crop of Indian corn. A dryish soil admitting of an early application of the plough we consider preferable, and we endeavour to sow it as early in the spring as we can stir the ground, and have it remain light.

We calculate to sow about five pecks of seed to an acre, and our crops have been from twelve to twenty two bushels. I believe that sixteen bushels per acre has been about an average yield.

The success attending our endeavour to cultivate this valuable species of grain, has induced many of our neighbours to try the experiment, which has resulted in a full conviction that, on our soil, we can raise more bushels of wheat per acre than of rye ; that it is much less liable to blast, and worth at least one third more per bushel for the actual support of a family, without regarding the superiority of the flour in point of comfort and luxury.

For the last three years, I believe this town has produced annually about a thousand bushels, and the last season we had at least four times as many bushels of wheat as of rye from the same number of acres in the same state.

I have now answered all the queries proposed in your communications above referred to. You will now permit me to suggest one or two remarks not inapplicable to the subject.

I consider wheat a valuable kind of grain to sow on ground intended for a crop of grass the succeeding year; more favorable to the future crop than rye or oats.

It is well known to every farmer, that our grass is frequently killed immediately after the crop of English grain is taken off of the ground, by exposing the tender plant to a scorching sun, at a season of the year, when the ground is most likely to be parched with drought. As the wheat straw is not so tall as rye, and not so thickly covered with leaves as the oat plant, the change is less severe when the crop is removed, and the grass scarcely experiences any ill effect.

I would likewise remark, that we invariably wash our wheat before sending it to the mill. This may appear unnecessary when the grain is not injured by mildew. But in our part of the state, and I believe in the Commonwealth generally, our soil is rather sandy; much more so than is common in the middle and western states, where wheat is cultivated in abundance. Such being the case, it is impossible to gather our grain and thresh it without its being covered in some degree with dust, which is hurtful to the flour.

The expense of washing is very inconsiderable. An active man will wash ten bushels in two or three hours. Care ought to be taken not to have it remain longer than necessary in the water. We usually dry it on blankets or sheets in the sun. Care should likewise be taken not to have it get too dry, as the flour in that case is not so nice. One day's sun is sufficient to dry it in the summer, and two in the fall. If suffered to become too dry the hull or bran is brittle and cuts to pieces in grinding, so as to mix with the flour. When only dried sufficient to prevent its clogging the mill, the flour separates much better from the bran, and is far preferable for use.

If, from what I have now said, any other question should occur, if you will do me the honour to address me a line on the subject, I shall be happy in giving you any information in my power on a subject of such high importance to my fellow citizens. I have written in haste, and you will be so good as to excuse inaccuracies.

I am, &c.

BEZALIEL TAFT, Jr.

To the Corresponding Secretary.

FROM MR. JOHN JENKS.—*SAME SUBJECT.*

Salem, November 3, 1814.

SIR,

NOTICING in the Palladium a request to those, who had raised wheat this season in the vicinity of the sea coast, to make some communication thereon to the Agricultural Society, I have taken the liberty to make the following statement; hoping it may be useful to some of my fellow-citizens that they may make exertions to remove our dependance upon the southern states for our wheat or flour. Last winter I purchased in the market of a person from Vermont some wheat, with an intention of making a trial to raise a crop the ensuing season, therefore I was very particular in my inquiry what kind it was? (*Summer bearded wheat*, was the kind I wanted.) The man assured me this was of that kind, for he raised it himself from seed he sowed in the spring of 1813. I purchased four bushels. Upon his emptying it from the bags, I observed to him, that there was a mixture in the grain of some oats, barley, and rye; he replied, that there was some oats that grew with the wheat, but the barley and rye he supposed got amongst it by the wheat's being threshed upon the same floor where he threshed his barley and rye. Being determined to have my wheat clear from every other grain, I had it picked over by hand to separate it from every other kind of grain, (and a tedious job indeed it was.) Having effected the separation, I measured the wheat and found it one peck short, in consequence of the foul seed; then I procured another peck to make up my quantity of four bushels for the two acres. Being doubtful as to the quality of this peck, I kept apart and sowed it by itself. Upon inquiry of the Vermont man, respecting the time he sowed the wheat, he said he generally sowed this kind as early in April as the frost would let him get it into the ground; consequently I judged that if in Vermont he sowed early in April, I might get my seed into the ground in March, but the frost would not admit of my ploughing until the 30th of March, and even then some spots would not admit the plough. Having ploughed it, I harrowed it over and let it lay three days to dry, as the weather was fair. I measured off

my ground exactly two acres; with respect to the seed, I took two bushels and put it into a tub, with weak ley, made from wood ashes, and one and three quarters of a bushel in another tub with sea-water, and let both soak just eight hours; then I drained off the waters and spread the wheat upon a tight floor, and sprinkled slaked lime upon it and raked it over until it was all covered with the lime and dry, it then appeared all over white as rice. I kept both parcels apart and had them sowed apart, to see what effect it would have upon the produce, but upon a close examination through the season, I could not perceive any material difference as to the growth or produce. The peck I procured to make up my quantity for the two acres, I soaked in weak ley only an hour, and then limed and sowed it by itself upon a quarter of an acre adjoining the land already sown, (only making up the two acres,) this was much blighted and produced little in comparison with the other part of the two acres.

The first week in August, I had it reaped and housed. I was particular to examine the wheat upon the one and three quarters of the acre, found no blight and but very few heads smutted, (so called.) As soon as convenient I had it threshed out and measured, found the produce to be forty-four bushels of well grown wheat. The seed I sowed weighed sixty pounds to the bushel; my produce when first threshed out weighed sixty two pounds the bushel. The land on which this grew, is a good dark, rich mould, within about one hundred rods of a salt marsh; yet I do not think it any way impregnated with the salt water. I have improved it for mowing only about twenty years until 1813, when I had five acres broken up and planted with Indian corn, the produce of which was three hundred bushels. This year when I sowed the wheat, I had herd's-grass and clover sowed with it to lay down the two acres; the grass was well grown and the ground wholly covered when the wheat was reaped. I mention this circumstance, as I think if no grass had been sown the crop of wheat might have been better, both as to quantity and size of the grain.

I have washed and dried three bushels of the wheat, and had it ground and bolted, and it yielded one hundred and four pounds of fine flour, as good and as white as New-York flour is in general; if we had burr stones and good bolting cloths, I doubt

not but it would compare with any Philadelphia or Baltimore superfine. You will please to excuse my prolixity, but it is my hobby, and you must permit me to ride a little. I have this season also made a little experiment upon 7-8ths of an acre, with seven pecks of *a bald six rowed barley.* What my produce is exactly I cannot now say, but upon an acre and 3-5ths, the produce this season was fifty-five bushels, not having wholly got through the thrashing and cleaning. I have also had three bushels of this barley ground; one bushel was bolted and produced a good flour; the other two bushels was well ground, and has been used with wheat middlings, instead of rye with Indian; it makes bread as good as rye and Indian, not quite so adhesive, but dryer and short; this grain is very productive, not subject to blight as rye is, and it weighs sixty pounds to the bushel.

In February, 1813, a gentleman returned from France and brought with him some barley, (much larger than the above described,) and this also is *bald.* I received about two spoonfuls, which I sowed in a bed in rows as we do carrots; this produced about three pints, of which I gave away a pint. And this season I sowed the quart in rows, sixteen inches apart, and each grain four inches apart, and had the rows kept clear of weeds and hoed; the product of this quart is about three pecks. Each ear or head will average about twenty-three kernels, and weighs fifteen grains; of the other kind, forty-nine kernels weighs fifteen grains, yet I think the smallest barley the most profitable, and will produce the greatest quantity upon the same ground; for I observed that the small barley produced more by double the number of stalks upon one root than the large two rowed barley. I have heard that E. Prebble, Esq. has raised some large barley; perhaps it is of the same kind that I have mentioned. I have enclosed a sample of the kind, but under an opinion, that the Society are not unacquainted with this species of barley.

I am, &c.

JOHN JENKS.

P. S. Some manure of barn compost was spread upon the land before it was ploughed for sowing the wheat, and ploughed in about two cart loads to an acre.

To the Corresponding Secretary.

ON THE INFLUENCE OF SOIL AND CLIMATE UPON WOOL.

BY ROBERT BAKEWELL.

CHAPTER I.

On the soft and hard qualities of wool, and the great difference in the value of cloth made from these wools, although each sort may be equally fine—Distinction between hair and wool, &c.

Wool may be found on some sheep, which, if grown on any other animal, would be called what it really is, hair; the same animal will produce in other parts of its fleece, true sheep's wool. Some animals, as the vicuna, the Angora goat, &c. though they produce coarse, long hair, produce also other hair so silky, soft and fine, as justly to entitle it to be called wool; being in these qualities superior to the finest Spanish or Saxony sheep's wool. The yak of Tartary, of which there is a description and plate in Turner's Account of Tibet, appears to be a species of wool-bearing ox. The oxen of Hudson's Bay also, if naturalists rightly inform us, produce a wool finer and softer than the vigonia or vicuna wool; it must be therefore the finest wool hitherto known. The peculiarity which has given the name of wool to some kinds of hair, is the smallness, softness, and pliability of the fibre, whence it is capable of being spun, and woven into a cloth which will *felt* or *mill* into one uniform texture, and by the process of fulling, will cover the surface of the thread with a pile. When the hair of any animal is too hard and elastic to admit of the same effect being produced by a similar process, we cease to call it wool. Now *some wool has a much nearer resemblance to hair in the hardness and elasticity of its fibre, than other wool equally fine.* Cloth made from such wool, is hard and harsh to the touch, loose in its texture, and the surface of the thread is bare.

Hence, it is much less valuable than cloth made from the softer wools. The difference in the quality and value of two peices of cloth, manufactured in the same manner from wools possessing the same degree of fineness, will be much greater than is generally known, or than those not well acquainted with the fact would be inclined to believe.

Nor is the subject fully known to many engaged in the woollen manufacture; but it is better understood than it was a few years since, and the soft silky quality is now more highly valued. This may be traced to the improvements which the introduction of machinery has effected in the cloth manufactory, and also to the different manner in which fine cloth is now finished. Formerly the manufacturer, in showing his cloth, was more anxious to exhibit the fineness of the thread than prove the softness of the pile. For this purpose he used to scrape off the pile from a small part of the cloth, to display the smallness and regularity of the spinning: since he has been enabled by machinery to spin a small even thread with great facility, the practice is discontinued. Cloth is now finished without that hard, shining surface, which was given to it a few years since by hot-pressing, which prevented the softness of the pile from being felt. By the present mode of cold-pressing, the softness of the pile becomes immediately perceptible to the touch, and is considered as one of the most distinguishing and essential qualities of a good cloth. The division of labour may also have prevented the value of the softer wool from being sooner known. The wool buyer in the distant counties, and the wool stapler who sorts the fleece, are generally unacquainted with the cloth manufactory. The Yorkshire manufacturer sells his cloth in the undressed state; it is bought and finished by the cloth merchant, who formerly was unacquainted with the process of the manufacture and the qualities of wool. If in a promiscuous parcel of undressed cloths bought at the same price, and apparently of the same quality, some were finished much better, and softer than others, it was attributed to lucky chance—the patron divinity of the ignorant. A spirit of investigation is now prevalent; many of the cloth merchants have also become manufacturers, and have an opportunity of observing the effects which the hardness or softness of the wool produces on the cloth in a finished state. From some or all of these causes, the value of soft wool is better understood,

and has greatly increased. It may be affirmed, that taking two packs of sorted wool of the same apparent fineness, one possessing in an eminent degree the soft quality, the other of the hard kind, the former will, with the same expense to the manufacturer, make a cloth, the value of which shall exceed the latter full twenty-five per cent.

The improvement of this quality of the wool, must therefore be of much importance to the wool-grower and manufacturer. It has hitherto been little understood, or attended to; to show how it may be obtained, is the principal object of the present work. As connected with the same object, I shall also notice the other qualities of wool, on which the external action of soil or climate have any influence.

It will invariably be found, whenever lime or calcareous earths come in contact with wool, they deprive it of its soft quality by their action on the surface of the fibre. A demonstrative proof of this effect is offered, in the process of separating the wool from the skins by the fell-monger. The pelts are steeped some days in lime and water; the softest wools, when thus exposed to the action of lime, lose their distinguishing excellence, and acquire all the harshness of wools grown on limestone soils. The hard wools have this quality increased by the same operation; hence the value of skin wool is considerably less than that of fleece wool equally fine. This fact alone is decisive, and proves, that the hardness of wools in limestone districts is occasioned by the external action of the soil, and not by the food of sheep. Nor will it be difficult to ascertain, in what manner the lime acts upon the wool: it absorbs the natural grease or yolk of the fleece, and forms with it an imperfect soap, which is miscible with water, and easily washed away by the rain. The wool, thus deprived of the unctuous cover intended to keep it soft and pliable, is exposed to the air and rain, and the staple is laid bare to the caustic operation of calcareous earth.

Argillaceous or clay soils are more favorable to the production of soft wool. Clays have an unctuous, saponaceous feel, and they possess not the caustic absorbent qualities of lime. Sandy soils may fill the fleece with siliceous particles, but these particles will not combine like lime with the yolk, and absorb the unctuous covering of the wool. In the process of the fell-monger above stated, the same effect is produced in a few days

by the application of lime in a more caustic state, as that which takes place from the slow but constant operation of the limestone soil on the growing fleece. A similar change also takes place on shorn wool kept long in a very warm and dry temperature; the fibres become indurated and elastic, and acquire the properties of the hard wools. The greater the degree of warmth, the more speedily will the effect be produced. If wool be exposed for a few minutes to a degree of heat just below what would scorch and discolour it, it will never regain its former state of softness and pliability. The useful arts may here receive an illustration from the curling irons of the frizeur, or the more durable effect of baking the hair, practised by the peruke-maker. It is twisted round small tubes or pieces of tobacco-pipe, and kept in an oven moderately heated, by which it becomes sufficiently hard and elastic to retain a permanent curl. It is well known to cloth manufacturers, that wool which has been shorn three or four years, will not spin or felt so well as when kept only one year. A dry situation is necessary for the preservation of wool, but after a certain time, it loses the natural moisture of the fleece, and becomes hard, like the wool from limestone districts.

Dr. Parry says he is informed by the cloth manufacturers in the west of England, that in very hot dry weather, they cannot make a piece of cloth from Spanish wool so good in appearance by nearly two shillings a yard, as it would be if made in a cooler, moister season. He adds "so far as I can learn, the heat and drought render the wool more intractable and elastic." In Yorkshire, it is well known that cloth dried in hot weather, or in an over-heated stove, will not finish so well, or feel so soft, as that which is dried by a more moderate degree of warmth, and in a moister state of the atmosphere.

I have purposely omitted to state the injurious effects of extreme heat on the soft quality of the growing fleece, as I intend to confine the first chapters to objects of practical utility. In our temperate latitude, this cause can rarely produce any injury.*

* But temperate as the latitude may be, it is still produced. The wool of our merino sheep, after shear-time, is hard and coarse to such a degree, as to render it impossible to suppose that the same animal could bear wool so opposite in quality, compared to that which had been

An examination of the African fleeces would, however, change the opinion of those who deny the effect of climate on wool. In many of the African sheep, there is evidently a tendency to produce fine, valuable wool, and I have no doubt they would do it, if removed to a more favorable situation. All these fleeces have lost their soft quality, and mill or felt with great difficulty; the yolk has been absorbed by an arid soil, and the wool nearly baked by a parching sun.

The experiment of producing fine wool from Spanish sheep, has been fairly tried in Saxony for nearly half a century. I have had in my possession, and carefully examined, many hundreds of these fleeces, which equal in fineness, the very finest Spanish wool I ever saw. The wool is true grown, viz. there is but a very small quantity of an inferior quality in any part of the fleece. It is also entirely free from a coarse silvery hair running through the fleece, common to many piles of Spanish wool. It will spin finer, when carded, than Spanish wool, and is suited for light kerseymeres, pelisse cloths, &c. The price, if due allowance be made for extra waste and for the wool being unsorted, exceeds this year that of the best Spanish wool. It is sold in England, at this time, for 6*s*. 8*d*. and 6*s*. 6*d*. per pound in the fleece, which is washed on the back of the sheep; but is cleaner than the general run of English fleeces. In this state, the average weight is nearly one pound and three quarters to two pounds. This may surely afford sufficient encouragement to those who are desirous of improving our fine clothing wools. With the above admissions, I must however observe, that in some valuable qualities, the wools of Saxony are inferior to the Spanish, and I have little doubt this is occasioned by the influence of climate. This wool is less sound in the staple than Spanish wool, nor will it make a cloth of equal firmness and durability. From frequent examination of Saxony fleeces, I am persuaded that their supply of yolk is not so copious as in the native Spanish

clipt from it in the course of the same season. As the cold weather advances, the fleeces recover their soft quality. Whether this harsh feel of the wool in its earliest growth arises, supposing that it cannot be the effect of chalk, from the heat of the sun, or the absorption of the yolk, we know not, but such is the undoubted effect; it is probable, however, that it will be more obvious in the finer piles, where the yolk usually abounds, than in the coarser ones, which are destitute of it.—*Somerville.*

sheep, nor is the wool grown so close upon the skin. In general appearances, these fleeces nearly resemble those of the best Norfolk; they are much finer, but a good judge of wool would have no hesitation in saying they were grown on a soil and in a climate nearly similar. Hence it may be fair to infer, that the soil and climate have effected a change, and assimilated them to other wool under the same influence. The want of soundness in the staple would be a great defect in the Saxony wool. for the general purposes of the cloth manufacturer. It may arise from occasional deficiency of food, from extreme cold, or from the fleeces being long and frequently exposed to rain.

To preserve all the best qualities of wool from the Spanish breed of sheep, it will be necessary to attend to three objects. The first in importance is the purity of the breed, which can only be preserved by the greatest care, and by the nicest judgment in selecting the rams and ewes. Secondly, to observe that the fleece be covered by nature with a copious yolk; and where this is deficient, that it be supplied by art: nor should we suffer the unctuous covering of the wool to be absorbed by a mixture with the soil on fallow lands, or washed away by the rain; to this the ointment will be less liable than the natural yolk. It is also necessary that the sheep be kept dry, and sheltered from the extremes of heat and cold. The third object is, to regulate the quantity of nourishment given to sheep.

The first of these objects I must leave to the intelligent wool-growers. The second I have already adverted to, as far as relates to the covering of the wool, and it is not my province to point out to the practical farmer the exact manner in which he may best provide a convenient shelter for his sheep; the buildings, however, for this purpose, should have near the roof, sliding doors or windows on each side, to admit air in any direction, and to regulate the warmth. The practice of cotting, or housing the sheep at night, was found to be very beneficial to the wool. I am informed by my friend Mr. S. Wilkins, of Cirencester, that where cotting has been discontinued in Herefordshire, the wools have considerably deteriorated. I am surprised this practice, so necessary in our climate, has not been more general; and still more so, that it should be relinquished where the growth of fine wool was an object of importance. If there be any truth in what I have hitherto advanced, it is obvious that housing the sheep at

night, and providing them during the day a shelter from the rain and sun, must preserve and improve the wool; and would also essentially conduce to the health, comfort, and preservation of the animal.

The third object to be attended to, is the quantity of food. As a considerable difference of opinion exists with respect to the effect of food on the fineness of wool, and as the question is still *sub judice*, I shall be excused in stating my own observations on this subject. A sudden removal to a rich luxuriant pasture, has a tendency to increase the fleece, and make the wool coarser. I assert this from repeated examinations of its effect on forest sheep removed into pastures to fatten. I believe some breeds of sheep resist this effect more than others, and the Spanish perhaps more than our native sheep.* I have stated that this effect is occasioned by a removal from a poor to a rich pasture. I do not, however, by this mean to assert, that some breeds of sheep will not produce fine wool when plentifully supplied with nutritious food. This may be the case with the Trashumantes, or fine-wooled travelling sheep in Spain, which are said by some writers to exceed in fatness the stationary coarse-wooled ones. It is not the absolute quantity of food which animals consume, but the proportion of nourishment each species may contain, that we ought to attend to. If food be supplied in nearly the usual quantity, and be of a kind on which the animal will thrive, it will produce no change in the wool, and it is of little consequence whether it be given in the form of grass, hay, or turnips; whether in enclosures or open fields. I admit with Dr. Parry, that the great and sudden change which appears to take place after enclosures in the

* This effect has been ascertained on my own flock for many years past; not only on the Merino and Ryeland, but on the wether sheep of the pure Merino race, to the number, the mixed breed included, of many hundred sheep every year. These sheep have been constantly depastured on very rich marsh land during the summer months, and no degeneracy in the wool has resulted, but on the contrary an improvement; such is the opinion of those who purchased it; perhaps they considered the wool less incumbered with dirt and more full of yolk, and therefore gave it the preference. The causes of this, however, with other details, will form part of a statement to be published hereafter, in continuation of a former work on this subject, which I thought it my duty to make public.—*Somerville.*

quality of wool, is generally occasioned by the introduction of a heavier breed of sheep. Were it the interest of the farmer to grow fine wool in the same situation, he might effect it by a careful attention to the breed, and by limiting the quantity of food given to his sheep. That the latter circumstance is necessary to be attended to, was the opinion of Mr. Bakewell of Dishley: he said to me the year before his death, "he had no doubt that fine wools might be grown on rich pasture lands by overstocking them, and preventing sheep from obtaining more nourishment than they had been accustomed to." I state this, because I am apprehensive that the opinion of Mr. Bakewell on this subject, has been mistaken by Mr. Turner, who is quoted by Dr. Parry as an authority, that Mr. Bakewell did not admit the effect of food or climate on wool. It is probable that Mr Bakewell had stated, that different kinds of food made no alteration in the wool, for it was not the kind of food, but the nourishment it contained, to which he attributed any effect on the wool. Until the change occasioned by rich pastures on the wool of Spanish sheep be fully ascertained, it would be desirable that they should be supplied with nearly the same quantity of nourishment to which the parent flocks have been accustomed, provided that this be sufficient to keep them in a healthy state. Baron Schultz, in his account of the sheep of Sweden, informs us, that some of their fleeces may be increased from two pounds to four pounds by an increase of food. M. Fink, although he does not admit that increase of food injures the quality of the Saxony fleeces, yet he allows it will increase their quantity. It must do this either by lengthening the staple, or by enlarging the thickness of the fibre: in other words, it must make the wool longer or coarser; in some instances it may do both. There is one undeniable fact, which may silence every doubt on this subject, as it is not an inference from any partial or local observation, but is proved by the general experience of wool-buyers in every part of our Island. After a fine open winter, a greater quantity of wool is produced, than when the season has been severe; in some instances, the difference will amount to full one-fifth of the aggregate weight of the whole quantity of wool grown in the kingdom. The fleeces at such times are considerably larger, but the wool is always coarser; as the wool-sorter knows by long and constant experience.

The enlargement of the fleece, and the increased coarsness of its hair after a mild winter, are chiefly occasioned by the greater quantity of food which sheep obtain at such seasons, when vegetation has been but little checked by severe frosts. Farmers who have flocks of the long-woolled breed, and are accustomed to supply their sheep with plenty of food during winter, sometimes trust too much to the mildness of the season, and withold this supply altogether. Hence some lots of wool are not unfrequently found to be lighter after a mild, than after a severe winter; the fleeces will be jointed in the staple, and finer in the hair near the joint. Such wool is rendered unsuitable for the comb. The farmer is generally willing to acknowledge the cause of this defect. I bring this instance of the effect of increase and decrease of food on long combing wool; because in such wools, the changes they occasion are more striking and perceptible to those unaccustomed to minute and nice examinations of the fibres of wool.

Excessive heat is highly injurious to wool; in our temperate latitudes, it may be unnecessary to direct the attention of the wool-grower to its operation; but I will however venture to assert, *that in proportion to the regularity of the temperature in which sheep are kept, and to the regular supply of nourishment they receive, will the hair or fibre of the wool preserve a regular, even degree of fineness.* From an observation of the wools of Africa, I am convinced that the arid soil destroys their softness, and the parching heats produce great irregularity in the fineness of the hair. In Portugal, where the same attention is not given to sheep as in Spain, and they are more exposed to the summer heats, the wool is less regularly fine, and more intermixed with coarse silvery hairs. A cool moderate temperature is more favorable to the production of fine wool than excessive heat; and were the sheep of Spain, like those of England, unprotected against the effects of climate, I should have no hesitation in saying, that the situation of that country would be in some respects worse than that of our own Island, and more unfriendly to the growth of a fine even staple. But to the other qualities, the soundness and softness of the fibre, our frequent rains are very prejudicial, unless the sheep be sheltered and defended from their effects. This only proves, that greater attention is required to external causes acting upon the fleece than has hitherto been thought necessary in England. With due precautions to counteract these

causes when prejudicial, I have no doubt fine wool will continue to be grown in Britain, equal in every good quality to the Spanish or Saxony fleeces. The prejudices of the manufacturers on this subject, must yield to repeated proofs ; and the time will come, when they will reflect with gratitude on the exertions of those distinguished characters in the present reign, who have, by a judicious attention to the breed of sheep, done so much to improve the wool of their native country.

CHAPTER II.

On the formation of Wool, Hair and Silk. Observations of Mr. Lewenhoeck. On the Roots of Hair. On the [illegible]lting quality of Wool and Hair. Opinion of M. Monge respecting it. An Experiment to ascertain its Truth. On the Furs of different Animals, and the causes which occasion the same hair to be grown coarser or finer at different Seasons. On the Defects of Wool. The jointed Staple. Cotted fleeces, &c. The effect of Climate on Wool. Improvement and Application of the Furs of different Animals. On the formation of Feathers. Cause of the Moult. Microscopical Observations. Hints from Nature for the Improvement of Wool.

The preceding chapter was confined to objects of practical utility, and I have endeavoured to avoid the intermixture of speculative inquiries in what has been advanced.

In the present chapter I shall attempt to bring some illustrations from analogous facts, and to state some microscopical observations, tending to confirm my conjecture respecting the structure and formation of wool. I offer them as hints to excite the curiosity and direct the attention of future inquiries to this subject.

An acquaintance with the formation of wool and the structure of its component parts, could not fail to be of some use, both to the wool-grower and the manufacturer : it might assist the former in his endeavours to improve its qualities, and guide the operations of the latter when he wanted to produce effects depending on some of its properties, which are not clearly understood or sufficiently attended to.

I have stated my opinion, that wool and hair are formed from the same fluid, but differently modified by the secreting vessels,

and thus possessing different degrees of elasticity and induration. I suppose each hai or fibre to be secreted from the albumen by imperceptibly minute vessels uniting in others still larger, till the different filaments secreted from each, are united and collected into one excreting duct near the surface of the skin. The filaments thus collected in a viscous state, probably acquire consistence by the absorption of oxygen, and become a solid fibre or thread, which is protruded in the form of wool or hair. Each fibre, whether of wool or hair, is thus composed of a number of minute filaments, laying parallel, and closely adhering to each other. The adhesion of these filaments in some hairs, is too close to admit them to be perceived by the microscope; in others they may be distinctly seen, and in the large hairs of some animals, they may even be separated and subdivided to a certain extent.

The formation of silk I believe to be nearly analogous to that of wool, but it takes place externally and visibly. M. Jaquin, professor of chemistry at Vienna, informs us that "silk, the web of all other caterpillars, and the silk of the *barba pinnæ marinæ*, are chemically considered almost the same substance as wool, from which they differ merely because they are less susceptible of colours, and on account of some peculiar properties when dyed." Mr. Lewenhoeck observed that the spider has five large papillæ, or what he calls working instruments, from whence five threads of viscous matter issue, which immediately unite and become one solid thread. These five threads are each of them composed of a great number of other filaments inconceivably small, which unite as they are spun out. Mr. Lewenhoeck says there are sometimes not less than four hundred small threads uniting together to form the last thread. The reason of this division of the viscous matter into such minute filaments, he states to be, that it might by such minute division acquire immediate solidity by contact with the air, and also that the thread might possess flexibility; for he adds, "as the spider's web to the naked eye, appears single, yet consists of a great number of other threads, and thereby acquires greater strength; we may from hence conclude that no flexible bodies, except metals, can attain to any degree of strength, unless they consist of long united parts, and the more these parts are twisted or cemented together, the stronger they are, which is very obvious in flax, silken thread,

ropes, &c. And thus also hair or wool, according to its fineness, has more or less strength, because each of these hairs consists of longer and finer parts, which are united by a viscous matter. It is necessary, he observes, to make a thread so strong and thick as those of the spider's web, with the viscous matter thrown out of the animals body, that it should be divided into a great number of small threads, to be immediately consolidated by the air. One hundred of these small threads will not make one hundredth part of the thickness of a single hair of the head.

On examining the roots of hairs which have been recently plucked out, I have sometimes seen with the microscope, several distinct small fibres uniting and joining at the bottom of the hair. I have no doubt a great many more would have been perceptible, had they not been broken off close to the bottom in separating it from the body. These fibres were nearly transparent. In all microscopical observations on wool and hair, the greatest attention is requisite, to prevent any optical illusion from their semi-transparency. The first appearance of a bright line running up the hair, has induced many to suppose it was a hollow tube. This deception arises from the refraction of the rays of light on the sides of the hair; a solid thread of glass will present exactly the same appearance.

I was not aware, when I first formed this opinion respecting the structure of wool, that it was confirmed by the authority of that minute and accurate observer of nature, Lewenhoeck. He says, "Each fibre of hair and wool consists of long and finer parts united, together by a viscous cement, and covered with a crust or bark." This is probably merely the same viscous cement spread over its surface.

The observations of M. Bon, on spiders and spider's silk, confirm the discoveries of Lewenhoeck. The formation of wool takes place by a slower and more gradual process under the skin of the animal. Silk acquires immediate solidity by contact with the air, owing, as has been before stated, to its filaments being so extremely minute.

The fibres of wool and hair being thicker, require a longer time to become solid by desiccation, or by the absorption of oxygen. That oxygen can be absorbed through the surface of the skin, is evident from the well known experiment of placing dark venous blood in a closed bladder, and exposing it to the action of

oxygen gas, where it acquires the bright red colour of arterial blood, notwithstanding the interposition of the bladder.

The minute vessels which secrete the wool or hair-forming fluid, unite in the excreting duct near the surface of the skin, where the hair or fibre is formed. The duct has the appearance of a bulb in the roots of human hair, with an opening nearly similar in form to the mouth of a trumpet, from whence the hair is protruded. It is not improbable, that the hair may receive, by the alternate constriction and expansion of the orifice of the duct through which it passes, minute indentations or ridges on its surface, which occasion the roughness we feel when it is drawn through the fingers from the point to the root. To this peculiarity of the surface, M. Monge attributes the felting quality of wool and hair. (*See Ann. de Chymie, tom.* vi. *p.* 300, *&c.*)

"The felting of wool or hair, is an effect resulting from the external conformation of their fibres, which appear to be formed either of small lamina placed over each other, in a slanting direction from the root towards the end or point of each fibre, like the scales of fish lying one over the other in succession from the head to the tail; or of zones placed one upon another, as in the horns of animals; from which structure each fibre, if drawn from its root towards its point, will pass smoothly through the fingers, but if it be drawn in a contrary direction from the point towards the root, a sensible resistance and tremulous motion will be felt by the fingers. This peculiar conformation disposes the fibres to catch hold of each other, and as they cannot recede when acted upon by other bodies, they naturally advance by a progressive motion from the root towards the end."

The hairs of wool, when carded and spun, are laid in every direction, and when they are compressed and agitated, this disposition to catch each other, and move from the point to the root, must inevitably bring the whole mass closer together. This is the case when cloth is fulled or milled, by which it is shortened both in length and breadth. Not being perfectly satisfied with the account given by M. Monge, I adopted a very simple experiment to ascertain its truth: I took a staple of coarse wool, of considerable length, with the hairs laying regularly in one direction. At the distance of an inch from each end, I made a tight ligature with a thread; I measured the middle of the staple between the threads, and then proceeded to mill it, by compressing

it with my hand in a solution of soap and warm water. I continued the operation until each end of the staple beyond the thread was felted into a hard knob or button, which could not be separated by the fingers. The middle of the staple remained unfelted, the hairs quite distinct from each other, and it was not in the least shortened by the process, either in the wet state or when dried. In the middle part of the staple, between the two threads, the hairs were kept in the same direction by being tied, and could not acquire the retrograde motion, or adhere by the surfaces catching hold of each other. The hairs at the end of the staple being at liberty to double and move in different directions, were soon felted together into a smooth hard and round knob, in which the ends or points of tho wool were entirely buried.

It is possible that lime may injure the felting quality of wool, by depriving it of its moisture, and making it more elastic; and also by its causticity, it may destroy the extremely minute ridges on its surface, on which its felting quality depends.

The cause of the felting quality of wool and hair is little understood or attended to, and involved in some obscurity; I may, therefore, be excused for dwelling upon it, as it is of considerable importance in the cloth and hat manufactory. That the felting quality depends on the tendency of the hair or fibre to move in one direction when repeatedly pressed, I have little doubt; but whether this is occasioned by indentations, or by rings, or zones, or any inequality of the surface, will not admit of proof, as they cannot be discovered by the microscope, though we can feel a sensible degree of roughness when hair is drawn from its points to the root between the fingers. The sensation excited, is somewhat similar to the vibration felt in drawing the point of the finger over the smooth edge of a glass. Reflecting on this circumstance, it occurred to me, that the roughness or tremulous motion we feel in drawing a hair through the fingers in the manner I have described, may be caused by minute vibrations, which are more easily excited in one direction than another, owing to some peculiar arrangement of the particles, or of the small filaments which compose the substance of wool or hair. Whether the tendency of the hair or fibre to move in one direction when pressed, arises from a peculiar vibration, or from inequalities of its surface, it is certain, that on this its felting quality depends.

This motion has been compared to that of an ear of barley placed under the sleeve of the coat, with the points of its beards downwards; by the action of the arm the ear is moved in a retrograde direction, until it has advanced from the wrist to the shoulder.

A farther illustration of this is given in an account of the process of hat-making. "When the straight hairs of the beaver, the rabbit, &c. are not intended to enter into the body of the mass, but are only to be employed in making a sort of external coating, such as is sometimes given to the outer surface of hats, the felt on which they are to be fixed being finished, the hair is uniformly spread upon the surface to which the coating is to be applied; and being covered with a cloth, it is pressed with the hands, and agitated for a certain time. By these means, the hairs introduce themselves by the root a certain depth into the felt, and are there fixed in such a manner as not to be easily extracted. If the agitation were continued for a longer time, these hairs would pass entirely through the felt, going out at the opposite surface, as each hair follows exactly the direction it acquired at the beginning."

If wool and hair be formed in the manner I have before stated, many peculiarities in their growth admit of an easy explanation. Wools are generally grown finer in the winter than the summer months. During winter, sheep have not the same copious supply of food as in summer; hence the wool-forming fluid will be diminished in quantity: the cold may also be supposed to contract the ducts near the surface of the skin. Some animals produce very coarse hair in summer, the bottom of which in winter will be a fine down or fur. Many of the secreting vessels in such animals, which unite in the last duct to form hair, may probably in the cold season cease to act altogether, and only such of them as secrete the very finest part of the fluid which forms down, may remain at that time in an active state.

Other animals inhabiting the polar regions, grow a long coarse hair, and distinct from this, a very fine short wool or down, close to the skin. The fine down seems intended to keep the animal warm, and the coarse hair to defend the down from the action of the elements, or from being worn away by the rocks and ice on which such animals repose. The fine down is secreted by smaller vessels, and probably from a finer part of the same fluid.

In these animals, the formation of hair and down may proceed at the same time, as they grow from distinct vessels. The South Sea seal produces a wool of this kind, which being buried under the coarse hair, was long neglected. It is now manufactured into cloth and shawls by Messrs. Fryers, of Rastrick, near Halifax. These shawls exceed in softness those of Persia or India.

Thus, from the tenants of the main, the inhabitants of frozen seas, has the ingenuity of man drawn materials to contribute to his wants and luxuries, more delicate than the productions of the celebrated Vale of Cashmire.

If the above account of the formation of wool and hair be admitted, the stoppage in the growth of wool which forms a jointed staple, and also the production of stiff or cotted fleeces, may be accounted for. When from disease, but more frequently from a deficiency of food and warmth, the animal ceases suddenly to secrete the wool-forming fluid, if this continue only for a short time, and by increase of warmth and food it again produces wool, a division in the staple will be seen, and by pulling it at each end, it will break where the stoppage in the growth took place.

Where the above causes operate for a longer time, the wool already formed having ceased to grow, and being deprived of a farther supply of yolk, is by the motion of the animal, and the action of wet, felted into a stiff cott. In some fleeces this takes place before the wool has separated from the skin: in others, the wool is nearly detached from the back, and connected only by a few scattered hairs where a languid formation of wool is going on. In some instances the formation of a new fleece has begun under that which is cotted. This takes place when the animal has again a better supply of food. The new fleece is connected with the cott by a few hairs in each staple which had never ceased to grow. Ewes which have had more than one lamb, and have been exposed to cold and wet, or scantily supplied with food, are most liable to have their fleeces cotted.

Immediately after shearing, wool is generally formed more rapidly and coarser than during any other period of its growth. That wool grows faster at this time is acknowledged; and hence M. Fink, in his account of the sheep of Saxony, explains why sheep produce a greater quantity of wool when they are shorn twice in the year, than when they are shorn only once in the same time. The increased growth of wool after shearing, I believe

arises from the pressure of the grown wool upon the secreting vessels being removed, whereby a sudden re-action and activity are given to them, and a greater quantity of the fluid is formed. The vessels may be also more expanded and stimulated, by exposure to the rays of the summer sun. Hence, the top of the staple which was grown immediately after shearing, will in most English wool be found coarser than the bottom part. I know it may be said, that the top of the staple is that portion of wool which was close to the skin at the time the animal was shorn, and was once the finest part of the wool. But this is not true, for the points of the staple are constantly wearing away and rubbing off; it is there the wet remains, and decays the wool. This is the true cause of the brown colour at the top of the staple, which some writers have thought it difficult to explain. A minute inspection will make the truth of this apparent, for it will invariably be found, that where the top of the staple remains discoloured after washing, a partial decay has taken place. This effect will be in a considerable degree prevented, by the first application of the ointment which I have recommended.

On examining a staple of English wool, we shall generally find, that the bottom part of it is rather finer than the upper, and the top part or point is coarser than the middle. The points were grown soon after shearing; the upper part, or rather more than half of the whole length, was grown during the summer and autumnal months; the bottom or finest part was produced after the commencement of winter, and from thence to the time of shearing. It may be objected to what I have before advanced, that if increase of food and warmth had a tendency to make wool coarser, the part of the staple which was nearest the skin at the time of shearing, being grown in May or June, should be as coarse as the middle part, which was grown in the autumnal months. We must however recollect, that in spring the fleece has nearly acquired its full size; and experience has informed us, that when the staple is near its usual length, the wool forming secretions are diminished, and its growth proceeds very slowly. If a fleece remain unshorn, and continue to grow two years, the quantity of wool produced in the second year is much less than what was grown the first. Any cause which diminishes the wool-forming secretions, or in other words, the quantity of wool grown in a certain time, has a tendency to

make it finer; and hence we may learn the cause of the wool being finer at the bottom of a full grown staple, than at the top. When the old fleece is removed, either by shearing or by falling off, new energy is given to the secreting vessels. I suspect also, that the exposure of the skin to the action of light and air, contributes something to this effect.

The direct rays of the sun in the tropical regions, appear to contract many of the pores whence the finer fibres of wool issue, and to enlarge others, thereby forming coarse hairs and kemps. I once examined the coat of a ram brought by a relation of mine from the banks of the Mississippi: it was a fine sound healthy animal, but it produced no fleece; it was thinly covered with short coarse hairs or kemps, under which there was a slight appearance of a fine down or wool: this might probably have been increased by proper management; nothing, I conceive, would have contributed more to this effect, than keeping the surface of the skin soft by rubbing it frequently with olive oil. The animal was given away soon after I saw it, and I had no opportunity of learning the effect which change of climate might produce.

It is doubtless ordered by a wise provision of the Author of Nature, that the same animals should be adapted to live in various climates, by the changes which different situations produce in their constitutions and habits. Hence we find that sheep, when removed between the tropics, and greatly neglected by man, will in a course of time divest themselves of their useless and cumbrous fleece, and be clothed in short coarse hair. By providing them with suitable shelter, and by great attention, wool might continue to be grown near the equator; but I believe its best qualities would be greatly injured, unless the flocks had the advantage of ranging on very elevated mountains.

In the more temperate climate of Buenos Ayres, wool is grown of the greatest length of staple I have ever seen; the hair was very coarse, and had been much neglected, as the fleeces were filled with the tops of a species of thistle peculiar to that country. Some of the staples measured twenty inches. There was also in these sheep a tendency to produce a very soft short wool covered by the coarser fleece. This short wool had nearly the appearance of the coarser kinds of the Vicuna wool. If we could suppose that the original breed of sheep

were the same with that which I have noticed from the banks of the Mississippi, we should have a striking instance of the effect of soil and climate upon the fleece, when removed from the fostering care of man. The effect of light and air on the furs of many animals, is well known, and it has been remarked, that men who work out of doors, with their heads uncovered, have hard, coarse hair. This may be caused by desiccation, or by the absorption of oxygen in a greater quantity through the pores of the skin. Every circumstance of this kind, if attended to, might lead us to remark the care which is requsite to cultivate the best qualities of the wool or fur, on the coats of those animals which are applied to the use of man. What improvements these may admit of, we cannot conjecture, as it is only upon sheep that experiments of this kind have yet been made. If we suppose that the goat, the cat, and the rabbit of Angora, were not originally distinct varieties of their species, it would be an object of much importance, as well as of considerable curiosity, to ascertain the circumstances of soil, of climate, and of treatment, which gave to these animals a long coat of such peculiar softness. It seems still uncertain, whether the shawls of Persia and of India, are fabricated from the produce of the goat or the sheep. An expedition to obtain some of these animals, would offer a richer prize to our manufacturers, than the acquisition of the golden fleece; for British industry would soon convert the wool into fabrics of more value than their weight of the purest gold.

The finest wools of Europe, cannot in the least compare in softness with the Asiatic fleece.

Mr. Luccock is entitled to praise for suggesting that the coats of many tame and domestic animals might, like that of the sheep, be applied to the service of the loom. The sneer of assumed sapience may be excited by this suggestion, accompanied with the exclamation, "What! shear wool from the backs of bulls and asses! Was ever any idea so preposterous! Let us, however, bear in mind, that the horizon of ignorance is as contracted as the narrow bounds of its own limited experience; every thing beyond this is considered as absurd or impossible. Had these sapient sneerers lived in a period prior to the application of the labours of the silk-worm to the luxury or the convenience of man, with what contempt would they have treated

the observer of Nature, who having remarked some of the properties of silk, and anticipated its use, had hence ventured to predict, that in some future age, the imperial purple, the royal mantle which was to invest the shoulders of the mightiest potentates, would be fabricated from the cobweb of a grub. There is indeed no instance in the history of human industry, which would at the first sight appear more surprising than the application of this substance to the service of man. Instead of allowing ourselves to believe that what has been already done by ingenuity and perseverance is all that can be accomplished, we should rather contemplate the experience of former times, as affording us imperfect hints, which, if properly attended to, may lead to future improvements, and to discoveries of still greater importance.

Amongst the animals which seem suited to our climate, I would recommend an attention to the varieties of the Pacos and Vicuna. Some of these are nearly white, and I have little doubt, would, with proper attention, grow a fleece free from the long coarse hair with which its downy coat is frequently intermixed. The wool when clear from these hairs, would be worth thirty shillings per pound; and the flesh, if we may judge from the appearance of the animal, should be equal to venison.

A grazier in Leicestershire, who is also a dealer in wool, has observed that some of the Scotch cattle have upon their backs, what he called "soft woolly tufts of hair;" and he further noticed, that the cattle which had these tufts throve better than others, and he always gave them the preface when purchasing his stock. If such varieties were attended to, and promoted, probably we might obtain from them a valuable addition to the materials on which national industry might be profitably employed. Nor can this be thought improbable, if we recollect, that a breed of oxen is said to exist in Hudson's Bay, which produces a wool finer and softer than that of the Vicuna. We know already that the coat of the latter animal, and of the goat, the rabbit, and of the amphibious seal, have been spun and wove into cloths and shawls, some of which were of greater value than any ever produced from the wool of European sheep.

In a former chapter, I have noticed the effect of increase of food on the qualities of wool. If the Spanish sheep resist this

effect longer than the English, it may arise from the peculiarity of its constitution, whereby the increase of nourishment is applied more to fattening the animal, and the production of yolk, than to the secretion of the wool-forming fluid; or its pores may more firmly resist dilatation from the impetus of increased secretion; the staple of the wool may thus be grown longer, but the hair may continue equally fine. The effect of heat, light, and air, in increasing the secretions, and dilating the excretory ducts, and thus forming coarse kemps, might be explained in the same manner; and also many other peculiarities attending the growth of hair and wool; but I have already extended this article beyond my original design.

Before I conclude, it will, however, be proper to reply to an objection which may be made, against what has been here advanced respecting the structure and formation of hair and wool. I have stated their substance to be similar to that of feathers. In the latter, there is evidently a circulation and secretion carried on until the feathers have obtained their full size. This objection will be removed by an attention to the difference in the structure and growth of each. Hair or wool, when first protruded through the skin, is perfectly formed, and each part of it is of the same size which it ever after retains. But it would be impossible for any portion of the feather to be formed full grown and perfect within the skin. A tube or stem first appears, from which the other parts afterwards shoot forth, and are supported and increased by circulating fluids from the parent bird. When the extremities of the feather are fully formed, they become indurated, the smaller vessels close up, and the circulating fluids recede lower and lower down, until they are at length denied all farther entrance into the quill.

Such I apprehend to be the process of Nature, and that this entire cessation of the accustomed secretions occasions the disease which we call the moult. This is probably a species of fever. The bird loses its cheerfulness and relish for food, and is seized with sudden shiverings. The disease continues until the old feathers fall off, when the secretions are again renewed, by which the bird is restored to health, and acquires a renovated plumage.

Hair is as fully and perfectly formed after it leaves the skin as the extremity of the feather in its most mature state; it ap-

pears to grow merely by the addition of new hair at the bottom, which protrudes it forward. On the contrary, feathers, and all bodies which grow and increase from interior circulation, not only grow from the upper part, but continue to enlarge in every dimension until they are full grown. The difference between the growth from the top and sides of the feather, and the elongation by mere juxta position at the bottom of the hair, appears to me clearly to indicate the different modes of their formation. It may tend to confirm the opinion I have advanced respecting the structure of hair and wool, that hair is frequently observed to split at its points into different fibres; a division has also sometimes been seen in the hair of wool. This seems to prove that they are formed by a number of distinct long filaments uniting in one thread or hair, as I have described. It is not, however, on hypothetical reasoning that I rest the proof of this opinion. I have ascertained its truth in some instances, by an examination of the hair of different animals, both with the single and compound microscope. In large hairs I have discerned a number of divisions from the root to the point. In one hair I distinctly perceived fifteen of these divisions or fibres laying parallel to each other, and in some of the fibres a further subdivision was distinguishable. Probably these subdivisions were each composed of others still smaller, which the limited power of our instruments may prevent us from discovering. If such be the structure of the hair of some animals, it is at least probable the hair of all others may have a similar conformation; although the fibres of which they are composed may be too minute, or adhere too firmly together, to admit us to separate or distinguish them. It were almost needless to add, that wool, whatever may be its peculiar qualities, is still the hair of sheep, and must be formed by a process of the animal economy similar to what produces the hair of all other quadrupeds. I might offer as a farther confirmation of what has been here advanced, that it may be fairly inferred from wool and hair remaining long after they are separated from the skin without any perceptible change, that they have not been deprived of any secretions from the circulating fluids by this separation.

Whether wool be composed of tubes and vessels receiving increase by constant circulation and secretion of fluids from the animal, or whether, like the silk-worm's web, it be a solid un-

organized thread, composed of finer filaments, may appear a question more curious than important. But if the latter opinion be well founded, which both deductions from analogy and the minutest microscopical researches render probable, it will lead to consequences of considerable practical utility, and teach us to bestow more care and attention on the unshorn fleece. Nature, when she produces wool, provides for it, and covers it with an oily secretion, or yolk, and thus intimates that she has confided its future defence and preservation to external applications. When, from accidental circumstances of situation, this yolk is absorbed, or its copious secretion is prevented, she has given us the power of supplying the deficiency, of assisting her intentions, and improving her operations, by the application of ointments better suited to resist the effects of soil and climate. Thus by attending to the intimations of Nature, man is enabled in northern latitudes to cultivate and bring to perfection, both the animal and vegetable productions of southern and more favoured regions.

ON THE USE AND CULTURE OF SEA KALE.

[For the Massachusetts Society for Promoting Agriculture.]

Roxbury, November 20th, 1814.

GENTLEMEN,

PRESUMING that any improvements in horticulture tending to increase the number or improve the quality of our culinary vegetables, are embraced within the objects of our Society, I take the liberty to introduce to the notice of the public, through your journals, a very valuable vegetable which has of late years been extensively cultivated in Great Britain, and much esteemed as an addition to the list of esculent vegetables.

The sea kale, which belongs to the cabbage tribe, has been long known in Devonshire and other parts of Great Britain bordering on the sea, where it grows wild in a light sandy soil. The inhabitants of these counties where it is indigenous have long used it as a culinary vegetable, but its general introduction is much more recent. It was unknown to Mr. Philip Miller, that

most indefatigable and intelligent gardener, when he published the quarto edition of his Gardener's Dictionary in 1771.

At present it is one of the most favorite articles of cultivation for the table.

It is the most tender and delicious of all the numerous species of the brassica or cabbage, not excepting even the cauliflower. It does not like most cabbages form a head, and it would be both coarse and tough if it were not bleached. It is a very early plant, ready for the table without being forced about a fortnight before you can cut asparagus.

It has one advantage over all other vegetables, except the asparagus, and that is its being a perennial plant, and of course requiring but little trouble.

Various essays have been written in England on its culture, but I thought it would be more useful to state what had been its mode of culture and success in our own country, especially as there are important differences arising from the difference of climate. For example, in England it is necessary to sow it in the fall, as it will not come up the first season. In this country it will grow as readily the first season as any other plant.

The soil ought to be rather light and dry. In deep, rich and moist land it is very apt to rot.

The seed should be sown in rows about three feet apart, and the stools or plants in each row should be also three feet asunder. Three seeds should be sown in a place, two of which may be removed after they have taken, and the most vigorous plant left.

In the first and every succeeding fall the dead leaves should be carefully removed lest they should rot the crowns of the plants, as they are very large and succulent.

The crowns are generally about one or two inches above the ground. In our climate the crowns should be covered in November with sea-weed, litter, tan, or if neither of these are at hand, the earth should be heaped around them.

In the spring, as soon as the frost is out of the ground, the earth should be dug around the plants, taking care not to wound or injure them. The crowns of the plants should then be uncovered and a pot, or wooden box, or a little fresh tan, or which is said to be preferable to either, some sea sand should be heaped over them to the height of one foot.

I have always used an earthan pot, and it is the most cleanly and simple plan, but would not so well suit those who should raise them for the market, as the expense would be too great. The common soil where it is dry will answer, but if the season should be wet the young shoots will be apt to rot.

About the middle of April, sometimes sooner, you may open the earth or remove the pots to examine the state of the plant.

If it is sufficiently grown you can cut it. One head will furnish enough for a dish. In cutting it you must be careful not to wound the crowns. It may be cut down to within an half inch of the old crown of the last year. It should be cut but once in a season.

The shoots are of a most brilliant white, and the tops of them a beautiful violet, and they form, if thoroughly boiled, a vegetable certainly equal to the finest cauliflowers.

As its principal excellence next to its perennial duration is its preceding all other fresh vegetables in the spring, it would be advisable to give it the warmest and earliest situation in our gardens.

The curious and luxurious may have it at a still earlier period, by surrounding it in February with fresh horse dung at the rate of a wheel-barrow to a plant. This will be no loss, as the manure will be then on the ground ready to be employed in other neighbouring parts of the garden.

It has been considered in England where their list of vegetables for the table far exceeds ours, and where they much excel us in horticulture, as the most valuable accession made within a half century to their kitchen gardens.

My own experience has satisfied me, that it is entitled to the same attention with us, and it is perhaps of more consequence here, since it requires less attention and care than most plants, not demanding yearly removal, and in a climate so backward in the spring it is of great importance to cultivate those plants, which have so early a growth. Any further information which may be required by any cultivators I shall be happy to give when requested.

Your humble servant,

JOHN LOWELL.

N. B. I have cultivated this plant successfully for five years past. It ought not to be cut till the second year after it is sown.

NOTICE FROM A WORK OF MONSIEUR LELIEUR ON THE HEREDITARY DISEASES OF FRUIT TREES.

BY SIR JOSEPH BANKS.

[From Tilloch's Philosophical Magazine.]

M. Lelieur, a French gentleman who holds the rank of administrator of the parks and gardens of the crown, has lately published a book on the diseases of fruit trees.

In this he asserts that the disease called in French *le blanc* or *le meunier*, which shows itself by a mealy whiteness on the leaves of the peach tree or on the fruit itself in blotches, that destroy the flavour, is an hereditary disease; that plants raised from the kernels of trees subject to this disease, will produce plants in like manner infected, and will communicate the disease to grafts, taken from sound trees, inserted in them; and that grafts from diseased trees will certainly be diseased, although taken from branches that are quite free from the appearance of disease.

He attributes the same hereditary continuance to the *gum*, a disease more mischievous possibly than any other, to our grafted and budded stone fruits: and he is of opinion that this disease also may be entirely avoided, by grafting from trees that never have been subject to its attacks.

The importance of these facts to the interests of horticulture, will, it is hoped, justify the writer for offering this short account of them to the Society, though they are taken from the Moniteur of the 7th December, 1811, the book not having been yet brought into this country.

The *mealy disease*, he says, is certainly not contagious, and he instances a fruit wall at *Versailles* on which are many curious *peach trees*, some of which are much damaged by it while others are entirely free from it.*

* Judge Peters in a communication to the Philadelphia Agricultural Society, says, " When trees become sickly, I grub them up; I find that sickly trees often infect those in vigour near them, by some morbid effluvia."

ON THE CULTIVATION OF THE FULLER'S TEASEL.

[*Dipsacus Fullonum.*]

[Miller's Gardener's Dictionary. Willich's Domestic Encyclopœdia.]

The teasel is an article of considerable importance to clothiers, who employ the crooked awns of the heads, for raising the nap on woolen cloths. For this purpose they are fixed round the periphery of a large broad wheel; against which the cloth is held, while the machine is turned.

It is raised from seed, scattered on ridges seven or ten inches apart in the proportion of from one to two pecks per acre. The proper season for sowing is the month of April. The soil ought to be strong, rich clay, or what agriculturalists term, a *good wheat land;* when the plants are up, they must be hoed and well weeded, and the plants thinned out to let them stand a foot asunder. The first appearance of teasel is much like that of lettuce. The second year the plants will shoot up stalks with heads, which will be fit to cut in August—when ripe they turn brown. The stalk is a foot long. When cut, they are to be tied in bunches and set in the sun, or dried in the house. The common produce is about one hundred and sixty bundles or staves, of twenty-five stalks, to the acre. The heads should be pulled before they are quite ripe.

Note.—The gentleman who suggested the subject of teasel as worthy of our attention, and who is a member of the Board of Trustees, cultivated the teasel the last season on his farm in Roxbury and sold his crop at so great a profit that he could not but wish this important article should be more generally known and more extensively cultivated than it now is.

METHOD OF RAISING LARGE STONES OUT OF THE EARTH.

BY MR. ROBERT RICHARDSON, *of Keswick, in Cumberland.*

[From Tilloch's Philosophical Magazine.]

GENTLEMEN,

I, ROBERT RICHARDSON, of Keswick, in the parish of Crosthwaite, and county of Cumberland, beg leave to inform you, that I have found out a method to take large stones out of the ground in a very expeditious manner, and that by this means two men will take as many stones out of the ground in one day, as would require twelve men in the usual way of blasting, and afterwards using large levers, &c.

Where stones of from two to four tons each are to be taken up, two men will raise as many as twenty men in the usual way. The work is done by the power of a tackle, but by my method of fixing the tackle to the top of the stone, by the plug which I have invented, it will hold till the stone is pulled out of the ground, and laid upon the surface or upon a carriage, if required, all which can be done in a very little time. Stones of four tons weight or upwards, may be taken out of the ground within the time of five or ten minutes, by two men, without any earth or soil being previously taken from around them, or without any digging with hacks or spades. J. C. Curwen, Esq. of Workington, has seen and approved of my performance with this invention, and if the Society should think it deserving of a premium it would be gratefully acknowledged by,

Gentlemen,

Your obedient servant,

ROBERT RICHARDSON.

Keswick, February, 8th, 1808.

To the Society of the Arts, &c.

DEAR SIR,

I cannot suffer Mr. Richardson's letter to be sent to the Society without adding a few lines concerning it. I can bear ample testimony to the case with which the largest self-stones are lifted

by his method. I have seen one upwards of five tons lifted by four men. One of the plugs is sent for the inspection of the Society. There is no difficulty in cutting the hole to recieve it, the only care is not to make it too large. It is difficult to explain the theory of its action; the least stroke laterally disengages the stone. In many situations it is likely to be of great use, not only in drawing stones out of the ground, but in making embankments, where the stones are only to be lifted a moderate height. One of my farmers in Westmoreland has made great use of one, and speaks of it in high terms; I have exhibited it to numbers of persons, who could not believe its power till they saw it tried.

Mr. Richardson submits its examination to the Society, and I conceive it will be very useful and beneficial in cases of new enclosures of land. I do not think it would answer for soft stones, or be safe to use for raising stones in buildings, it being so easily disengaged by any lateral blow. By adding wheels to the tackle machine, or having it upon a sledge, a great deal of time and trouble would be avoided. I purpose to employ this method next summer in making an embankment against the sea; the facility it will give in raising and removing large stones, will expedite the work greatly. If any further certificates of the performance of this plug be required, I will with pleasure transmit them to you. I will answer for its extracting any stone not exceeding five tons weight out of the ground, without any previous moving of the earth; and it is important to preserve large stones entire.

I am, &c.

J. C. CURWEN.

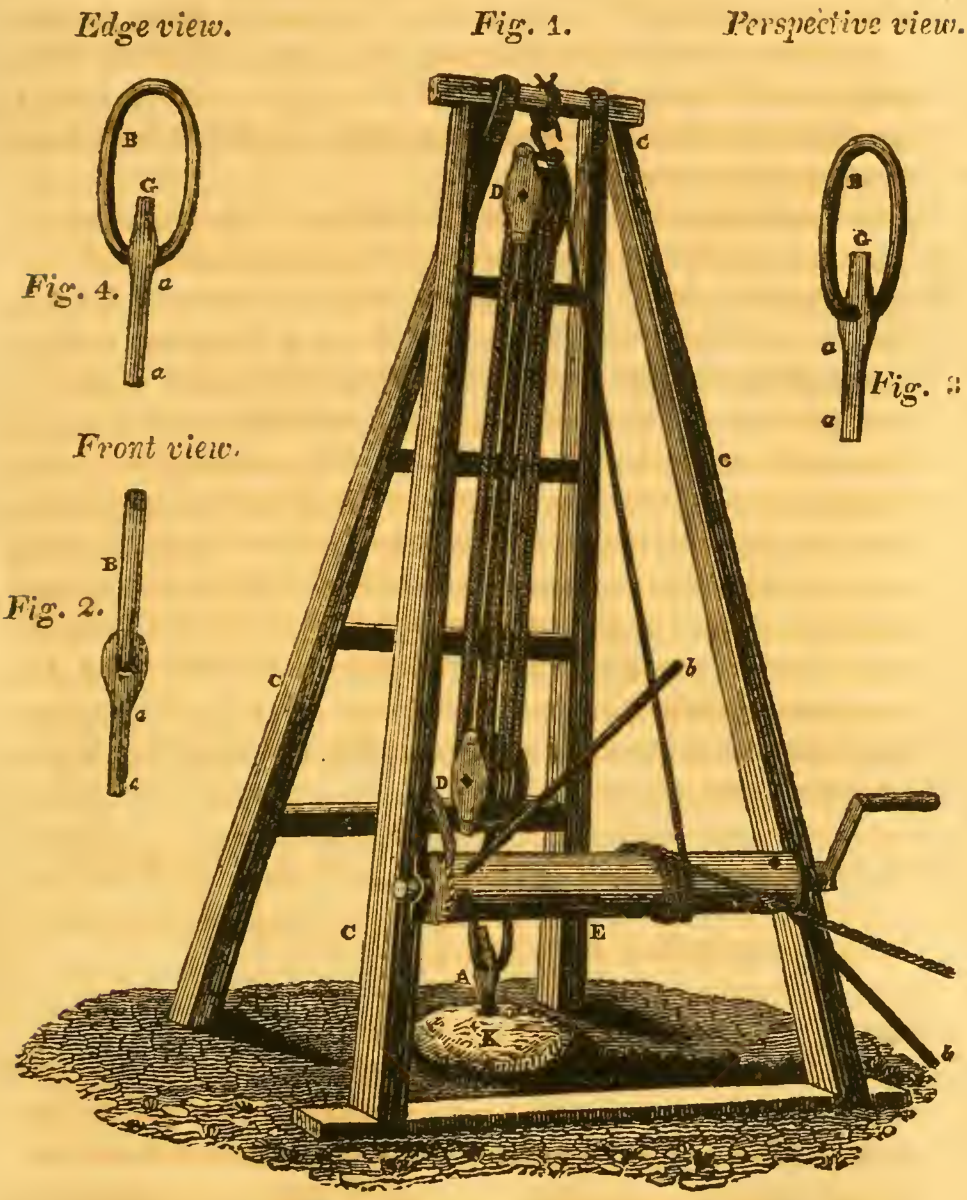
To C. Taylor, M. D. Secretary,
Workington-Hall, Feb. 1808.

SIR,

I am favoured with your letter desiring my opinion of the utility of the iron plug invented by Robert Richardson, of Keswick. That which I use is about six inches long, and one inch and a quarter in diameter; it requires a hole of its own size, only two inches deep; the plug is to be driven in a little short of the bottom, and will raise a stone of six or eight tons, with the assistance of three men, in the course of ten minutes after

MR. RICHARDSON's

Method of raising large Stones out of the Earth.



the hole is prepared; and I do not hesitate to say that three men, thus furnished, will clear the ground of large stones in less time and more effectually, than twelve men by any other method yet come to my knowledge. The plug should be made of good beaten iron. The simplicity and cheapness of the whole apparatus is a great object, as a good plug of the size I use will only cost two shillings and six pence. I am fully of opinion, that by adding more and stronger ropes and pulleys, work might be done by it to an amazing extent. I have reaped great advantage in my farm from the aid of the iron plug, and in justice to the inventor, am happy in vouching for its extreme usefulness, several of my respectable neighbours have experienced the aid and benefit of the above instrument, and will vouch, if required, for the truth of the above statement.

I am, &c.

ROBERT WRIGHT.

Rose Gill Hall, Westmoreland, May, 1808.
To C. Taylor, M. D. Secretary.

Reference to the Engraving of Mr. Richardson's Invention for Raising large Stones out of the Earth. See plate, figures 1, 2, 3, and 4.

Fig. 1, K. shows the upper part of a stone nearly buried in the earth, having a hole made in it three inches and a half deep, and one inch in diameter, by means of a miner's jumper; the cylindrical tail of the plug *a*, fig. 2, 3, and 4, which is of the same size, is driven fast into it, by means of a hammer applied upon the head of the plug G. This plug in its whole length, is nine inches, and has a hole made in its broad part H, through which the oval iron ring, B, passes easily, and on which the plug can move backwards and forwards, when the ring is hung upon the hook of the lower pulley block of the lifting tackle. C C C C represent the four legs of frame-work of the quadrangle; D, a five-fold tackle, with blocks ten inches in diameter; E, a roller seven inches in diameter, turned by two long iron levers, b b; the handle, I, is used as a safeguard, and to assist to regulate the power of the levers. In figure 1, the plug A is shown fix-

ed in the stone K, ready to draw it out of the ground, by means of the lifting tackle.

N. B. The hinder legs of the quadrangle are made to close in between the fore legs, for the convenience of carriage.

OBSERVATIONS ON THE REMARKABLE DECAY OF PEACH TREES, OF LATE YEARS.

BY R. PETERS, ESQ.

[From the Philadelphia Agricultural Society's Publications.]

The last meeting of the Society was favoured with a communication on the subject of *Peach Trees*, from Joseph Cooper, Esq. of New-Jersey, whose experience has enabled him to add much to our stock of practical knowledge. I was desired to give some account of what had fallen under my own observation, relating to this valuable and delicious fruit. I know not any in the catalogue of our trees, more desirable, nor more subject to mortifying decay, disease and destruction. Having cultivated it from my earliest youth, it should seem that I could give some certain and profitable mode of remedying its tendency to premature decay, and repelling the diseases to which it is invariably a victim. But I have found myself so frequently baffled in my endeavours; and have seen the fallacy of so many theories on this subject, that I diffidently affirm any thing respecting its culture or cure. It is therefore only in obedience to the wishes of the Society, that I express my opinions or experience.

About fifty years ago, on the farm on which I now reside, my father had a large peach orchard, which yielded abundantly. Until a general catastrophe befel it, plentiful crops had been for many years produced, with little attention. The trees began nearly at once to sicken, and finally perished. Whether by the wasp then undiscovered, or by some change in our climate, I know not. For forty years past, I have observed the peach trees in my neighbourhood, to be short lived. Farther south, in the western country, and, it seems, in some part of New-

Jersey, they are durable and productive, as they had been formerly here.*

In my youth, excellent plums grew here; now we can obtain none, but those of inferior species. In grapes we were never successful; though much more so than at present. Our wheat in modern times, is attacked by enemies unknown to our predecessors. Our apple orchards do not produce, as they did in early times. There must therefore be some change in our climate; and new races of vermin, not known to our ancestors. In cities and towns, grapes and plums, and I believe peaches, are in high perfection. The atmosphere in which they vegetate, possesses a character favourable to their growth; and their position admits fewer enemies to assail them. I am aware that it is a frequent mistake, to draw general conclusions, from partial facts. My opinions are formed on experience I have gained on my own property, and may not generally apply. I have near one thousand apple trees, one hundred and fifty grape vines, two hundred peach trees, and a number of plums. They are of all ages, kinds and exposures; and set out in every variety of soil. I have endeavoured to practise on every information to be acquired from books, or oral directions. I must therefore conclude from my frequent disappointments, that fruits in this part of the country, are uncertain in product; and have declined in quantity and quality, in a degree not formerly experienced. I have often observed, that in bad fruit years, the seasons were unhealthy for animals. *Insects* and their *larvæ*, or caterpillars, and other enemies to fruit, abound in such seasons. The products of the earth seem to be more favoured at one period, and in different stages of the settlement of our country, than at others. Advantages or misfortunes, merely local, have their influence. Some are perfected in old settlements; others thrive only when the earth is recently reclaimed from the wilderness of nature.

Of the peach, I have thirty-two varieties. Mr. Coxe, of Burlington, has double that number. But those I have are sufficient to enable me to form a general idea. I find some less exposed

* I have seen them also in great perfection, in and about Lancaster, and other parts, where limestone and other calcarious substances abound. The cause I do not pretend to assign; nor do I know the general duration of the tree, in that country.

than others, to misfortune and decay. It would therefore be desirable, to mark, and cultivate those most commonly, in which the most success could be counted on. Mr. Cooper has been successful, on this plan, in other products. Let him, and other curious cultivators, practise on this suggestion.

I have failed in many things, in which others are said to have succeeded. Straw and bass, or paper, surrounding the tree, from the root, at all distances, from six inches to three or four feet; white washing, painting, urinous applications, brine, soot, lime, frames filled with sand, oil, tar, turpentine, sulphuric acid or oil of vitriol, nitrous mixtures, and almost every kind of coating. I ruined several trees, by cutting them down, and permitting the stump to throw up new shoots, and branch at pleasure. All teguments kept the exsudation from evaporating with freedom. The pores being closed, or too open, were alike injurious. Teguments of straw or bass made the bark tender; and it threw out under the covering, sickly shoots. The more dense coating stopped the perspiration. The oil invited mice and other vermin, who ate the bark thus prepared for their repast and killed the tree. I planted in hedge rows and near woods, I paved, raised hillocks of stone—I have suffered them to grow from the stone only, grafted on various stocks and budded, hilled up the earth in the spring and exposed the butt in the fall, sometimes I have used the knife freely—frequently have left the tree to shoot in every direction—I have scrubbed the stocks or trunks, with hard brushes, soap suds and sand, scraped them with proper instruments: I have, for a season or two, under various experiments, amused myself with the persuasion, that I had discovered an infallible *panacea*. I had temporary success, but final disappointment.

The *aphis* or vine fretter, and many other insects are hostile to this tree. They injure it, by piercing, curling, and destroying its leaves. As to *frosts*, they are common enemies to all fruit.

Having thus candidly given an account of my failures, which never discourage, but animate me to new projects, I mention what with me has been attended with the most success.

The worm or grub, produced by the wasp, depositing its progeny in the soft bark, near the surface of the ground, is the most common destroyer. I remove the earth, a few inches round the tree in August or September. After July the wasp

ceases to pierce the bark, and to make its deposits. I pour around the butt of the tree, beginning about one foot above the ground, a quart or more (not being nice about the quantity) of boiling hot soap suds or water. This kills the egg or worm lodged in the tender bark; and of course prevents its ravages the next season. I carefully search the trees, though I seldom find worms. I do not perceive any injury from this operation. I have discovered worms in or near the roots of the smallest stocks taken from the nursery. These I frequently plunge into boiling water, before planting. I lose very few; and do not attribute the losses to the hot water. I have the trees bared at the roots, exposed to the winter. I have lost some in the way described by Mr. Cooper; but I still continue the practice. I have been in the habit of doing this for ten or twelve years, and prefer it to any other treatment. To supply deficiences, I plant young trees every year. By these means, I have generally fruit enough for my family, and frequently very abundant crops. How long I shall continue to prosper by this practice, is yet problematical. I have now some of the most healthy trees I ever possessed. When trees become sickly, I grub them up; I find that sickly trees often infect those in vigour near them by some morbid effluvia. The young trees supply their loss, and I have no trouble in nursing those in a state of decay, which is commonly a hopeless task.

I have been thus particular, to justify the inference from this statement—that, in this part of the country peach trees cannot be profitably cultivated on an extensive scale. But we may have great abundance of their delicious fruit, in every variety, if every farmer and horticulturist, would plant the number, to which he could attend, without interference with his other concerns. He might keep up a constant succession, by setting out a few every year. Our grain, and garden plants in general, require renewal annually; and peach trees require no more trouble. A tree with very little attention, will produce three or four crops. Its growth is quick; and it may be propagated easily, and come to perfection, in any soil of tolerable staple. As the older trees decay, or grow sickly, young and vigorous trees will begin to bear. The method which I have lately pursued is simple; guards against the worm, and affords me a plenty of fruit. I do not mean to discourage perseverance in

experiments, which may yet succeed. We must never part with hope; though she seduces and "cheats us o'er and o'er again." The ants of Grenada were exterminated by a single tempest.

Although I have had trees twenty years old, and I know some of double that age, (owing probably to the induration of the bark rendering it impervious to the wasp, and the strength acquired when they had survived early misfortunes,) yet, in general they do not live in tolerable health after bearing four or five crops. And being among the most gummy, viscous, succulent and tender of our fruit trees, they require from the earliest stages of their growth more labour and attention, than could be profitably applied to an extensive plantation. I have too many to be sufficiently attended to; but a number of them, by their present appearance, warn me not to be uneasy on that score. The shoots of the last season were remarkably injured by the excessive drought; and the extremities of many limbs are entirely dead. I shall have, however, more than I require for myself, my friends, and my foes. I have a superfluity, to afford deductions made by plunderers; for whom, from necessity, I plant an extra number. The trees now verging to their last stage, are chiefly those set out in the locust year. They have never recovered the wounds, inflicted by this most pernicious of all insects.

Fifteen or sixteen years ago, I lost one hundred and fifty peach trees in full bearing in the course of two summers; by a disease engendered in the first season. I attribute its origin, to some morbid affection in the air, which has the most to do with all vegetation, as well in its food and sustenance, as in its decay and dissolution. The disorder being generally prevalent, would, among animals have been called an epidemic. From perfect verdure, the leaves turned yellow in a few days, and the bodies blackened in spots. Those distant from the point of original infection, gradually caught the disease. I procured young trees from a distance, in high health, and planted them among those the least diseased. In a few weeks they became sickly, and never recovered. I took the determination of grubbing up every peach tree, and converted them into fuel. In my own nursery, perceived I should have a hospital of incurables. The young peach trees being generally infected, I cleared the whole of them away Various kinds of fruit trees, in the same nursery, were

not in the least disordered. Trees, like animals, have inherent diseases, or a susceptibility to receive those, peculiar to their species. The peach seems most subject to this tendency; pears are liable to blights from the electric fluid. Iron hoops, old horse shoes, &c. hung on these trees, attract and conduct for a time, this floating fluid. But when the air is surcharged, destruction partial or total is certain. Cherries are fatally operated upon, by what is called the four o'clock sun. Plums too are exposed to peculiar disasters, which would lead me too far to detail; though I have paid much and unprofitable attention to them; and have, now and then, hit on temporary palliatives. Particular insects and vermin have their respectively favorite tree, or plant to prey on. They pursue the dictates of nature, for their own propagation and support; while, by destroying our sustenance and comforts, they become hostile to us. They compel us to wage against them a perpetual warfare.

After my general defeat and most complete overthrow, in which the worm had no agency, I recruited my peaches from distant nurseries; not venturing to take any out of those in my vicinity. I have since experienced a few instances of this malady; and have promptly, on the first symptoms appearing, removed the subjects of it, deeming their cases desperate in themselves, and tending to the otherwise inevitable destruction of others.

QUERIES ADDRESSED TO FARMERS.

[With a view to collect the most accurate information on the principal branches of agriculture, as now practised, the following queries are addressed to intelligent farmers and to Societies instituted for the promotion of agriculture. The answers subjoined are those of the NEWBURY AGRICULTURAL SOCIETY and the AGRICULTURAL SOCIETY IN VASSALBOROUGH.]

I. OF what quantity of land do the Farms in your vicinity generally consist?

Newbury. Seventy-five acres is an average farm.

Vassalborough. One hundred acres.

II. What is the quality of the Soil?

Newbury. Sand, loam, and clay: the loam is considered the best.

Vassalborough. We have almost every variety of soil, from the shallow mould on the ledge, to the bog that is apparently bottomless. There are large swells of moist land of a rich loam, interspersed with large stones; less swells of slatey land of a gravelly loam; a considerable proportion of clayey soil, free from stones; and some, which at certain seasons of the year is covered with water.

III. Into what portions of Pasture, Mowing and Tillage, Orcharding and Wood, are Farms usually divided? Are the Orchards improving or declining? Do they yield a competent supply of Cider?

Newbury. One seventh Orcharding and Woodland; and of the remainder, two fifths Mowing and Tillage, three fifths Pasture.

Vassalborough. About one fourth of an average farm is covered with the original growth; and about the same proportion is growing to young wood. They have about twenty acres of Pasture, twenty of Mowing, six of Tillage, and two of Orcharding. Orchards are improving; and afford Cider more than sufficient for the inhabitants.

IV. How much land on each Farm, is annually, (on an average of years,) planted or sown with Grain of any kind?

Newbury. About one thirteenth.

Vassalborough. They average about five acres of Corn and Grain on tilled land.

V. In what manner is the land prepared, manured, and seeded with each kind of Grain, and what is a medium Crop?

Newbury. We plough twice. For planting, we manure our land from ten to thirty loads per acre. We sow two bushels of wheat, three of barley, one of rye to the acre. An average crop of corn is forty bushels, of potatoes two hundred, barley thirty, rye fifteen, wheat sixteen to twenty bushels per acre.

Vassalborough. A crop of corn or potatoes having been taken off, the ground is then ploughed in the fall, again in the spring, harrowed, and sowed with wheat or oats, rarely with rye, and still more rarely with barley. Rye is sometimes sowed on sward land in the fall, and sometimes with oats in the spring.

VI. In what manner is Indian Corn cultivated, and what is the medium Crop on an Acre?

Newbury. We plough universally twice, and manure with from ten to thirty loads of manure.

Vassalborough. New, or sward land is broken in the fall or spring, and planted; when the corn is up, Gypsum is applied; (sometimes the corn is wet and mixed with Gypsum before planting,) it is usually hoed twice, but good crops are frequently raised with once hoeing. This crop being gathered, the land is ploughed in the fall, and manure put on in heaps. In the spring, again ploughed, then planted; a great proportion of the manure being put in the hills. It is hoed once or twice, very rarely three times: An average crop, when well tended, is from thirty to forty bushels per acre.

VII. What is the quantity and value of the Straw on an Acre of Barley, Rye, Oats and Wheat *respectively?* And to how much Upland Hay are they *respectively* equivalent for Fodder?

Newbury. About fifteen hundred weight of barley straw: its value is thought equivalent to half its weight of upland hay. The straw of other grain we consider of little value except for litter.

Vassalborough. Straw except oat, is seldom used for fodder. Oat straw is about one ton to the acre; equal to half its weight in good upland hay. Some mix rye and wheat straw with butts of corn, which answer a good purpose.

VIII. What is the value of Straw of each kind, for any purpose, *other than Fodder or Litter?*

Newbury. It is worth one and half load of manure; at fifty bushels per load. We consider it best for potatoes ploughed in when rotten in part.

Vassalborough. No use is made except for fodder or litter.

IX. What is the value of the Stover or Stalks on an Acre of Indian Corn, and to what quantity of Upland Hay is it equivalent for Fodder?

Newbury. Is worth twelve hundred of English or herds-grass hay.

Vassalborough. When mixed with, the fodder from an acre of corn is equal to half a ton of upland hay.

X. What quantity of land, on a medium Farm, is annually planted with Potatoes?—How is the land prepared? What quantity and kind of manure is applied to an Acre, and in what Manner? How much seed is used, and how is it selected? How are they cultivated, and what is a medium Crop?

Newbury. From one to two acres; prepared similar to Indian corn; manured with the coarse manure; seed from ten to fifteen bushels; cultivated similar to Indian corn; crop two hundred bushels.

Vassalborough. One acre. The roughest ground, capable of tillage is generally selected; ploughed and harrowed once. The manure, when used, (which is rarely the case,) is commonly put in the hills. From twelve to fifteen bushels of seed are commonly put to the acre, of such potatoes as happen to be on hand; generally hoed once, and an average crop is about two hundred bushels to the acre.

N. B. It has been customary to plant the small ones whole and cut the large ones; but from several experiments made the last season, it appears that the better method is to select the largest of the kind intended to be propagated, and to plant them whole. It also appears from some experiments, suggested the last season, by the scarcity of seed, that a much less quantity will answer than is usually applied. In one instance, five bushels only were planted on an acre, and more than two hundred bushels were the product. In another, more than fifty bushels were raised from three pecks of seed.

XI. How many bushels of Potatoes are equivalent, ordinarily, to one bushel of Indian Corn, for Sale?

Newbury. From three to four.

Vassalborough. Three.

XII. How many days labour of a man, are usually employed on an Acre of Indian Corn, including the getting in all the Stover and stripping the Husks from the Ears?

Newbury. From twenty to twenty-five.

Vassalborough. Fifteen.

XIII. What is the labour of Shelling a hundred bushels of Indian Corn, and in what manner is it performed?

Newbury. About seven days labour, performed by placing a spit across a box or tub and scraping the ear against the spit.

Vassalborough. When thrashed or pounded out in a barrel provided for that purpose, it requires about four days; but when shelled by hand, or with an Iron as the practice of many is, about ten days.

XIV. How many days labour of a man are usually employed on an Acre of Potatoes, including the getting in the Crop?

Newbury. The labour is about the same as that of Indian corn.

Vassalborough. Twenty-five.

XV. Is there any order or succession of Crops known to be beneficial or pernicious to the Soil?—If any, what is it?

Newbury. Flax we consider hurtful to the soil.

Vassalborough. We have made no experiments to determine.

XVI. What is the usual course of Crops?

Newbury. Planted two years with Indian corn, or potatoes; the third sowed with grain and grass seed; lay down to grass from three to seven years.

Vassalborough. Corn, wheat, grass.

XVII. What is the medium quantity of Hay produced on an Acre of Upland, and what is the labour of mowing, curing and housing it?

Newbury. Twenty-five hundred. About three days labour.

Vassalborough. One ton. Three days labour.

XVIII. What is the medium product of Hay, on an Acre of fresh Meadow; and what is the labour of mowing, curing, and housing, or stacking it?

Newbury. About one ton—the labour from two to three days.

Vassalborough. One ton, and three days.

XIX. What is the proportion of value which fresh Meadow Hay bears to Upland Hay, each being of a medium quality?

Newbury. About two fifths.

Vassalborough. Meadow hay is worth about half its weight of Upland hay.

XX. Is any Tillage land laid down with Grass Seeds, without sowing Grain at the same time? If so, which method is found best?

Newbury. Not any.

Vassalborough. None, except where flax is sown.

XXI. What are the kinds of Grass cut on the Upland for Hay? What proportion is from Seed sown by hand, and what are the kinds thus sown, and in what quantities *respectively* per Acre?

Newbury. Principally herds-grass and clover;—ten quarts of herds-grass seed, and six pounds of clover seed;—the proportion from seed sown by hand is about two thirds.

Vassalborough. Clover, herds-grass, and red-top; all from seed sown by hand, and ten quarts usually sown to the acre; but by some, a much greater quantity is thought preferable.

XXII. Are any Grass lands *new* seeded after scarifying them with the Harrow only, or in any other mode, without ploughing? And what is the success of such practice?

Newbury. Not ascertained.

Vassalborough. None.

XXIII. What weeds, vermin or insects infest the mowing lands?

Newbury. The white weed, radish, and dog grass, or fiorin; the two former are the most common. The insects are the grasshopper. The field mice are a growing evil; they bark the young apple trees in the winter.

Vassalborough. White weed is prevalent; yellow weed and thistles are increasing to an alarming degree; and grasshoppers are sometimes troublesome.

XXIV. Are the spontaneous or cultivated Grasses infested most?

Newbury. Not ascertained.

Vassalborough. No spontaneous upland grasses, and the meadow grasses not infested.

XXV. What methods are used to destroy weeds, vermin or insects, without ploughing the land, and what is their success?

Newbury. The most common way to destroy weeds is by careful tilling three or four years successively. We are sorry to say there are little or no pains taken to destroy the vermin or insects.

Vassalborough. No means are used.

XXVI. What kinds of Beasts, and in what numbers are they, respectively, kept on medium Farms? And how are they subsisted?

Newbury. From one to two pair of oxen, five cows, two or three young creatures, one horse, six sheep. Of late, sheep are increasing.

Vassalborough. On a medium farm are kept one horse, one pair of oxen, four cows, four young cattle, and twenty sheep. The cattle and horse are pastured from the 15th May to the 15th November; but the sheep support themselves about six or eight weeks longer.

XXVII. In what place and in what manner are the Cattle fed with the coarse winter Fodder? Is it given in the stable, in the yard or the field? Is it chopped or given whole?

Newbury. In the barns in the night, and in the day, in the racks or in the yard: sheep do best in the open air except in stormy weather.

Vassalborough. It is usually given whole and in the barn yard; sometimes however in the stable.

XXVIII. How much Butter is usually made in a year from a Cow, all the cream being churned? And how much skim-milk Cheese is made from this same Cow?

Newbury. For six months, five pounds of butter and five pounds of cheese, from the skimmed milk, per week.

Vassalborough. About one hundred pounds may be made from one Cow: The milk is not often made into cheese after skimming.

XXIX. What Food is given to Sheep besides Grass and Hay?

Newbury. In the spring, Indian corn, potatoes, turnips, carrots, &c.

Vassalborough. Oats, peas, beans, meal, corn, potatoes, turnips, &c.

XXX. What is the value of the Subsistence of a Sheep through the year, besides the Pasturage?

Newbury. One dollar and seventy-five cents.

Vassalborough. One dollar and twenty-five cents.

XXXI. What is the value of Pasturage for a Sheep compared with the Pasturage of a Cow?

Newbury. Eight sheep without lambs, and five with lambs.

Vassalborough. One eighth.

XXXII. What is the ordinary Weight and Value of the Flesh of a Sheep when fit for the Butcher? And what is the Quantity of Wool in a fleece?

Newbury. From thirty to forty pounds of flesh; three pounds of wool.

Vassalborough. Weight of sheep from forty to forty-five pounds; value, three dollars; average fleece two and an half pounds.

XXXIII. What Breed of Swine are propagated? How are they fed, how fatted? At what age are they killed; and what do they then weigh?

Newbury. A small boned kind, kept short in the yard the whole year, fed in the summer upon the wash of the kitchen and dairy, with some meat or potatoes, and generally kept thriv-

ing through the summer; in the fall their keeping is raised by adding more meal; are killed in November or December, at the age of about eighteen months; their weight from two hundred and fifty to four hundred and ten pounds.

Vassalborough. Little attention is bestowed on the breed of swine. They are the common swine of the country, to which, as far as we know, there is no appropriate name. They are kept on grass, potatoes, pumpkins, &c. till one and a half years old; then fattened on boiled or steamed potatoes and meal. Weight about two hundred and fifty pounds.

XXXIV. What number of Bee-hives are kept, what is their product in Honey and wax—what is the management—and what are the obstacles which discourage their extensive propagation?

Newbury. Bees have very much degenerated within a few years, but few are kept; we know not the cause.

Vassalborough. Bees receive but little attention; there is not perhaps more than one hive to two families. They however do well; and a hive affords about thirty pounds of Honey and two of wax.

XXXV. What is the usual quantity of land sowed with Flax-seed? How is it manured and cultivated? And what is the medium produce of Flax and Seed in quantity and value?

Newbury. From an half to one acre, manured with from twenty to thirty loads of manure; the crop from two to four hundred pounds; from six to eight bushels of seed.

Vassalborough. Flax is not much cultivated.

XXXVI. How much Labour is employed on a quarter of an acre of Flax before it comes to the Spinner, and including the preparing the Seed for market?

Newbury. Ten days.

Vassalborough. Eighteen days.

XXXVII. In what articles consists the Surplus of the Farmer which is sold or exchanged for other articles?

Newbury. Hay, barley, potatoes, winter fruit, garden sauce, &c.

Vassalborough. Beef, pork, veal, mutton, poultry, corn, rye, wheat, oats, peas, beans, butter, cheese, potatoes, apples, cider, wiskey, gin, wool, &c.

XXXVIII. How many Loads of manure are collected, (estimating thirty bushels to a load,) from the Cattle in the Barn-Yard, of a medium Farm, in a year—specifying the number and

kinds of Cattle kept on the same Farm, and the manner in which they are kept in relation to confinement or ranging abroad?

Newbury. From horses four loads, if kept in the stable; from horned cattle two load in the winter, and one in the summer, if yarded.

Vassalborough. The stock kept on an average farm, if yarded during summer nights, make about forty loads of manure.

XXXIX. What Quantity of Manure is made in the Hog-pen, specifying the number of Swine fatted, the kind and quantity of Food consumed, and the weight of Flesh produced?

Newbury. From two to four swine, as many load of manure; the keeping, corn and potatoes, &c.

Vassalborough. No one of this Society has been careful enough to mark the quantity.

XL. What methods are used to enlarge the quantity, improve the quality, or prevent waste of the Manure made in the Barn-yard or Hog-pen, and especially to save the Stale of the Cattle?

Newbury. Not ascertained.

Vassalborough. Straw is commonly scattered in the Barn-yard and sometimes in the Hog-pen, to enlarge the quantity, and the general calculation is to have one part of the Barn-yard lower than the other part. No methods are taken to save the stale.

XLI. Is the manure and tillage labour exclusively applied to the best parts of each Farm?

Newbury. Not ascertained.

Vassalborough. They are not.

XLII. In what manner and for what purposes is Manure used, except those indicated in the foregoing inquiries?

Newbury. Not ascertained.

Vassalborough. Manure is sometimes advantageously spread on grass land.

XLIII. What other Manures are used besides those created by the Stock, and what are their merits compared with these?

Newbury. Not ascertained.

Vassalborough. Gypsum and ashes are used.

XLIV. Is Limestone found in your vicinity? Is it used as a manure?

Newbury. Not ascertained.

Vassalborough. Not found.

XLV. Is Buck-wheat cultivated for the Food it yields? Or is it used to cleanse the soil from weeds, to fertilize and enrich it, or for any other purpose?

Newbury. Not cultivated.

Vassalborough. Buck-wheat is not raised for any purpose.

XLVI. In what manner are new Lands brought under Cultivation? Is it customary to plant Orchards in the new settlements?

Newbury. Not ascertained.

Vassalborough. The trees are cut in June; the fire is made to run through in the dry season, commonly September. They are then cut into pieces of about twelve feet in length, hauled togetheri nto piles and burnt. In the course of the fall, grain and grass-seed are sown and the ground harrowed. Orchards are planted.

XLVII. How is Land cleared, which bushes and under-brush have overrun, since the trees were carried off?

Newbury. Not ascertained.

Vassalborough. The bushes are cut in August, which is said to be done with most advantage, when the sun is in the heart. They are burnt in the fall, and grain and grass-seed are sown. Treated in this manner, they are seldom troublesome afterwards.

XLVIII. What is done with Swamps, or Swampy lands?

Newbury. Not ascertained.

Vassalborough. They have been generally neglected; but enough has been drained to shew, that with proper attention they will yield large crops of grass.

XLIX. Is the growth of Wood for timber and fuel equivalent to the consumption in your vicinity? If not, what measures are taken to provide against the inconvenience of future scarcity?

Newbury. It is not. But we have a substitute, peat or turf.

Vassalborough. The growth of wood is more than sufficient for home consumption; but is not equal to the whole consumption, including exportation and the waste occasioned by clearing. No means are taken to guard against future want.

L. Are Wood-lots generally fenced, or left open for cattle to range in without restraint? In getting your wood for fuel, do you pick the oldest trees, or do you cut clear? Which method is best calculated to increase the value of your Wood lands?

Newbury. Generally fenced; we cut the oldest or most decayed trees; the former.

Vassalborough. Wood lots are not fenced. There have been no experiments to ascertain the comparative merit of the modes of cutting; the prevailing opinion is in favour of cutting clear.

LI. What are the causes that the culture of Wheat can no longer be pursued on the sea coast of New-England?

Newbury. It is supposed owing to the easterly winds; we have however for the two or three last years, succeeded in raising wheat.

Vassalborough. Remote from the sea coast.

LII. How far has Gypsum, (Plaister of Paris,) been fairly tried as a manure in the maritime parts of this state? What have been the effects of the experiment?

Newbury. Not ascertained.

Vassalborough. Not known.

LIII. Is the European practice of a succession of Crops found to be expedient in this country, and in what order ought such a succession to take place?

Newbury. Not ascertained.

Vassalborough. The expediency of a succession of Crops has not been ascertained by experiment.

LIV. Is it perfectly ascertained, that with proper attention to manuring the land, it is more advantageous to change the crops than to keep it in Grass?

Newbury. Not known.

Vassalborough. It is not.

LV. Is there any crop so profitable as Grass, taking into view the state of markets in our country, and the distance at which most of our farmers are from a market?

Newbury. We presume none.

Vassalborough. Potatoes, rye and oats, are considered more profitable in this vicinity than grass.

LVI. Can the Farmers raise any crop which, on the whole, affords them so great a profit as Grass, unless they are within twenty miles of the capital?

Newbury. Not known.

Vassalborough. Not ascertained.

LVII. What are the most profitable crops which the state of Massachusetts, taking one year with another, furnishes?

Newbury. Not known.

Vassalborough. Not ascertained.

LVIII. What has been found to be the difference of profit between the Merino Sheep and the Sheep which formed our former stock?

Newbury. The merinoes are as productive as to wool and lambs, and can be kept as cheap, and are no more liable to death or disease than the old stock.

Vassalborough. Merino sheep have lately excited much attention in this and the neighbouring towns; but they have not been in this part of the country sufficient length of time to enable us to make a comparison between them and common sheep, in point of profit.

LIX. Is there any cheap Fodder which can be raised for Sheep, during the winter, which will supercede or will diminish the consumption of Hay?

Newbury. Not ascertained.

Vassalborough. Swedish turnips, carrots and potatoes.

LX. What is the comparative profit of a farm, adapted to the raising of Sheep, between the cultivation of Merinoes, and the raising of any other cattle?

Newbury. At this time none so profitable as merinoes; but at present, the prices of merinoes are so fluctuating, that no accurate calculation can be made.

Vassalborough. Not ascertained.

LXI. Is there any profit derived from the raising of Indian Corn, except for the subsistence of man, which can equal the employment of the same land in raising Grass for the support of Sheep and Cattle during the winter? What are the calculations on which such profits are founded?

Newbury. We say there is no profit in raising Indian Corn, except for the subsistence of man.

Vassalborough. There is none.

LXII. What are the improvements in Dairies which have been made within the last twenty years? Is the quality of the Butter and Cheese improved, and in what consists this improvement, and what are its causes.

Newbury. Not ascertained.

Vassalborough. Not known.

LXIII. Are there any improvements in the Tools of husbandry, which experience has confirmed, and what are these improvements?

Newbury. Not ascertained.

Vassalborough. Not known.

LXIV. Are there any new and valuable Fruits or productions, either contributing to the pleasure or profit of the citizens at large? What are they, what the mode of culture, and what their qualities?

Newbury Not ascertained.

Vassalborough. Not known.

LXV Are there any improvements in the breed of Cattle? What are they, what their qualities, and where can they be obtained?

Newbury. Not ascertained.

Vassalborough. Not known.

LXVI Are there any other improvements, (not comprised under the article of manufactures,) which have been made in any branch of Agriculture?

Newbury. Not ascertained.

Vassalborough. None in this vicinity.

EXPERIMENTS ON RAISING WHEAT, BARLEY, &c. WITH REMARKS.

COMMUNICATED BY GORHAM PARSONS, ESQ.

Brighton, November 28, 1814.

DEAR SIR,

I HAVE delayed, until this time, the communication promised you respecting wheat, in the hope of ascertaining the quantity of grain produced from an acre of ground, which, although much blighted and very inferior, would have enabled me to furnish the result of every attempt to raise spring wheat in this town the past season; not having succeeded in obtaining the desired information, beg leave to state the following facts from two of my neighbours, viz.—Mr. Edward Sparhawk sowed in April one bushel of wheat, on what he estimated three quarters of an acre, the soil light and very inferior to the other parts of his farm under cultivation; it was well manured and produced twelve bushels of clean wheat, weighing sixty-two pounds the bushel, full equal in appearance and heavier than the seed

he sowed. Mr. Asa Williams sowed half a bushel on one half acre of ground; the soil light and not equal in quality to the average of his farm; it was planted with potatoes the last year, and he used no manure preparatory to sowing his wheat; it produced six bushels and an half, and weighed fifty-nine pounds the bushel. Mr. Sparhawk and Mr. Williams obtained their seed from Capt. Hardy of this town, on whose land it grew last year.

I sowed four acres and thirty-two rods with four bushels, the land carefully measured by General Badlam, who is considered a correct surveyor; the soil equal in goodness to any part of my farm; ploughed in eight loads of manure to the acre, and laid it down with herd's-grass, red-top, and red-clover; it produced eighty-four bushels and an half of wheat, which weighed but fifty-eight pounds the bushel. In the same enclosure I sowed one acre one quarter and nine rods with one bushel the newly introduced barley from Mr. Preble, and laid it down fo grass in the same manner as the wheat ground, the soil of the same quality; it produced me twenty-seven bushels of barley, which weighed sixty pounds the bushel; in the month of September, I cut from the wheat and barley ground seven large waggon loads of clover; and allowing for some weeds and the stubble, think it may be fairly estimated at six tons when put into the barn well dried, the quality equal to the best rowing or second crop hay. The season was not favourable for grain; the rye in this town, and, I believe, in the neighbouring towns was much blighted; two pieces, one of winter and one spring, that promised much early in the summer, was so ordinary as hardly to compensate one for thrashing; and it was so on a farm adjoining me, which, for several years previous to this, has produced rye of an excellent quality, and the average quantity to the acre. I am satisfied my crop would have been better had double the quantity of seed been sown; say two bushels to the acre, particularly the barley which came up well, but did not spread as I expected. You will receive with this, samples of Mr. Sparhawk and Mr. Williams' wheat; comparing the two parcels, there does not appear that difference that the weight indicates. You have also a sample of my wheat in the ear, gathered previous to reaping, and before a long spell of rainy and cool weather, which I have thought injured it very much. You will perceive a striking difference in the ears, and I think

there must be two kinds of wheat, the red and the white; if there is in fact a difference, it must be owing to my procuring two bushels of my seed from Newton, in the county of Essex, which was mixed with that obtained from Capt. Hardy, who fell short that quantity in the different parcels I had engaged for myself and friends. When the unfavourable season of wheat and rye is taken into consideration, very little doubt, if any, remains on my mind, that we may in any part of our country, (I mean New-England,) raise this kind of grain with success.

Your obedient servant,

GORHAM PARSONS.

To the Corresponding Secretary.

FROM THE SAME, ON THE COMPARATIVE ADVANTAGE OF RAISING CARROTS ON RIDGES AND IN BEDS.

I TRIED the experiment of raising carrots on ridges and in beds, and the result has been, that from beds four feet wide, in which I had four rows, I took six bushels and one peck; and three ridges, (but three rows,) which took the same quantity of ground gave six bushels, the carrots very much superior, and weighed, (those raised on ridges,) fifty-three pounds more than those from the bed. But the difference in labour was astonishing; as carefully as I could make the estimate, that on the bed was forty-two per cent more than on the ridges; it was a piece of ground I took on shares, and was very weedy; in addition it was black heavy loam unsuitable for carrots, and the ridging such ground was perhaps more advantageous than if it had been a light yellow loam suitable for tap roots. But in my ground I am satisfied the labour is much less on ridges than on beds, and the former leaves the ground in much better condition after the crop is taken off.

Note.—I am trying to ascertain the quantity of hay a full grown sheep will eat in a week; and how much more is required for a sheep with a sucking lamb; and have kept an account of the vegetables and grain given to the two lots of sheep, which are separate for the purpose; should I find any material difference from the quantity stated in the books, will communicate it.

ON THE PREPARATION OF FOREST TREES FOR IMMEDIATE USE, AND INCREASING THE DURATION OF TIMBER.

COMMUNICATED BY CAPTAIN LAYMAN, OF THE NAVY.

[From Nicholson's Journal, May, 1813.]

[Whatever may, eventually, be the fate of the invention, which is the subject of the following article, we cannot hesitate to give circulation to a statement of facts, which however extraordinary they may be thought, appear to have been witnessed by a respectable Board of Agriculture in England. The discovery of some better method of seasoning, and fitting timber for durable use than any now practised, is an object of so much importance, that we shall gladly record in our Journal any experiments tending to promote such a discovery. The process employed by Captain Layman is not made known in the following communication; it may have been disclosed in some of the later English publications which we have not seen.

THE juices of a tree being, like the blood of an animal, essential to vitality, but tending to corruption immediately after dissolution, accounts for the well known fact, that the duration of timber is in proportion to the quantity and nature of the juices contained therein at the time of felling and when brought to use. It is therefore obvious, that by withdrawing such juices or blood from a tree while standing, the oak (as expressed by the celebrated Roman architect Vitruvius and by Pliny,) "will acquire a sort of eternity in its duration." But as neither the mode mentioned by those celebrated ancients of cutting a kerf round the bottom of a tree while standing, as performed at Bengal, or the one suggested by Dr. Plott, of decorticating the tree, leaving it standing, as practised by the natives of Malabar for ages, will effect this desideratum, I made the following analysis:

On the 1st of June, 1812, I made experiments upon growing young oaks, one of which, that had been operated upon,* was

* This oak, from the wetness of the season, contained six tenths of its weight in fluid; but in general I have found six elevenths in June and four elevenths in January, to be the quantity of fluid contained in growing oaks.

converted the next day, increased in strength in the proportion of four hundred and thirty-six to six hundred and nine, and when doubly prepared, to eight hundred and forty-six. And, as a test of comparative duration, I made extracts from the heart, and sap of the same tree in its natural state, and when prepared, the following is the result.

1. The sap or embryo wood, in its natural state, speedily concreted, and mucor or mould was formed in fourteen days.

2. The heart, in its natural state, contained much less putrescent matter than the embryo or sap, but a larger portion of gallic acid and acrimonious liquid. This extract had a smell like fetid ditch water, and mucor was formed in forty-nine days.

3. The heart of the prepared oak is perfectly sweet to the smell, and had no other appearance but a pellicle from the glutinous matter contained in the wood.

4. The embryo wood of the prepared part has the same appearance as the heart, being equally free from any symptoms of putrefaction.

On the next day I proceeded to verify the facts before a well attended Board of Agriculture, consisting of several members of both houses of parliament, who expressed a lively interest on the occasion: the following is the substance of a minute made by the President at the time.

Board of Agriculture, June 2d, 1812.

The Board adjourned to examine some experiments made by Captain Layman, on the preparation of forest trees for immediate use on being felled, by which the specific gravity is diminished and the sap (or embryo) wood rendered useful, as well as the strength and duration of the timber considerably increased. The following is the result, from pieces one foot in length and one inch square.

1. Poplar (Lombardy) cut from a tree in a growing state, broke with three hundred and thirty-six pounds.

2. Poplar (Lombardy) counterpart piece of ditto, *prepared*, in three hours, bore three hundred and sixty-eight pounds.*

* This experiment was made to show in how short a time wood could be prepared for use from a growing tree; but a young standing Weymouth pine which was experimented upon with a view to masting timber, and which was three days in preparing, had not only its weight re-

3. Seasoned English oak broke with seven hundred and eighty four pounds.

4. Seasoned English oak, *prepared*, bore nine hundred and two pounds.

This piece when broken, proved to be naturally defective internally; but a second piece, prepared by Captain Layman, appeared to have sustained one thousand and seven pounds.

5. Sap or embryo wood of oak *prepared* and *preserved*, bore nine hundred and thirty pounds.

6. Counterpart piece of ditto, in its natural state, broke with five hundred and thirty-six pounds.

7. Common white deal, in its natural state, broke with three hundred and thirty-nine pounds.

8. Counterpart piece *prepared* and *preserved*, bore five hundred and eight pounds.

Note.—Specimens were produced by Captain Layman to the Board, of the matter producing the decomposition of wood.

On the 23d of July following, I made experiments at the Navy Office.

No. 1. Dry rot timber (Canada oak) of the Queen Charlotte, as received from the Navy Board, July 18th, 1812.

2. Ditto cured.*

3. Dry rot and sound timber (English and Canada oak and pitch pine) of ditto in its common state.

4. Counter pieces of ditto, *preserved*. The above were put into bottles and sealed up by the Navy Board.

5. A piece of English oak, broke with two hundred and twenty-eight pounds. This was said, to be a bad specimen, but it was a counterpart of what the Queen Charlotte was framed with.

6. A piece of sound English oak prepared and preserved, bore eight hundred and ten pounds.

7. A piece of Canada oak, of the Queen Charlotte, in its natural state, broke with five hundred and twenty-eight pounds.

8. A piece of ditto, prepared and preserved, bore six hundred and sixty pounds.

duced, but its strength increased from two hundred and forty-three to four hundred and fifty.

* I must here repeat what I observed at the Navy Board at the time, that "prevention is better than cure."

9. A piece of pitch pine in its natural state, broke with six hundred and seventy-two pounds.

10. A piece of ditto, prepared and preserved, bore eight hundred and thirty-four pounds.

Upon this principle increased duration was given to *teak sisso*, and *saul;* which would be a great acquisition to the auxiliary aid required for our navy. But the most important result is, that trees of our own growth that succeed on the poorest soils in Great-Britain, which will not produce corn, are rendered very superior to any foreign oak imported, and preferable to the best English oak in common use for hull timber; and although some species are naturally weaker and heavier than foreign spars, they may be so prepared as to admit of being made into masts, yards, &c. *smaller*, *lighter*, *stronger*, and *infinitely more lasting*, than those made of American or even Russian fir.*

And as the sap or embryo wood, would not only be rendered useful, but the timber fit for immediate use, it would furnish the means to do away the waste of timber and loss of time and money that take place in what is termed *seasoning*, particularly in his majesty's ship yards,† either when a ship is framed, or,

* The roof of Westminster Hall, built in 1399, is formed of sweet chesnut, which probably grew in the neighbourhood, as the site of London was formerly a chesnut grove of spontaneous growth; yet the use of this fast-growing timber, which succeeds in the most barren sands, *is unknown in our dock yards*, as is that of the ash for the purpose of ship building, although its utility is so well known for agricultural and other purposes; and as it contains much less gallic acid than the oak or even the chesnut, it would be less destructive to iron.

† I have tried eighteen different methods of preparing and seasoning timber, and with only one exception found the mode, or rather the custom in use in his majesty's dock-yards to be the worst. In 1805, the late Mr. Alexander Mackonochie proposed a "Scheme for the ready seasoning of timber, in depriving it of its oxygen by means of condensed steam, which would leave a vacuum, and thereby draw out the fluids from the wood, that when so freed, if plunged into oil, their reentrance would forever be effectually precluded, and the strength of the wood found to be much increased, as well as the timber not only immediately seasoned, but preserved in all its pristine state." This appears very specious; but had the ingenious theorist brought it to the test, it would have been found to promote a tendency directly opposite to what was proposed. Some months ago, the principle of impregnating timber was again renewed, as in a work of considerable eminence,

what is yet more erroneous, by placing the timber in piles, as there practised. For as not only the cause of decay, but shrinking and rents would be removed, it is obvious that the timber for building a ship, or for any other purpose, might be readily formed on the spot where produced, exclusive of the saving in carriage or freight of at least one half. The timber although converted in different parts of this country or the world, would be ready to form part of a ship the instant it was delivered into the arsenal of construction; and as the decomposition of timber commences from the moment a tree is cut down, a ship so built in six months, in a dock or slip, *under cover*, would be much more lasting than one six years in building.* And if the plank, after being prepared, was brought to and combined to the timbers *without being transversely perforated*, it is clear, that if the timber were properly moulded, the fabric would be much stronger with at least one fourth less wood; and not only would the building of the ship be much facilitated, but in the event of requiring to shift either timbers or plank, from accident, it might be done as simply as shifting the stave of a cask. And if ships so constructed, when not wanted for actual service, had the masts taken out, and were placed in a covered *dry* dock, and kept well aired by opening a plank or two on each side the bottom, the duration would be infinitely increased.

If the duration of timber were in future doubled, it is evident not only that but half the number of ships would he required, but that half the present annual expense of building and repairing ships only would be required, and a like deduction of expense be made on all other fabrics in which timber is used.

published in September, 1812, it is stated—"Experiments, we understand, are now making at Woolwich, on the speedy seasoning of timber by stowing some hundreds loads in a close kiln, and introducing by means of a retort filled with saw dust an oleaginous substance. The idea is ingenious, but we augur no useful results from the experiments themselves." The unfortunate result a short time after is well known; for although owing to a particular circumstance, an active ingenious person was employed, an explosion took place, by which, exclusive of the damage, several men were killed and wounded.

* The Lively frigate was five years in building. The Queen Charlotte, 100 guns, seven years. The Revenge, 74, nine years. The Caledonia, 120, twelve years. Hibernia, 120, fourteen years. The Ocean, 98, fifteen years.

MISCELLANY.

[Selected.]

The slightest appearance of a tendency in sheep to produce discoloured wool, should be shunned like a contagious distemper. Such was the attention o the ancient shepherds of Italy to preserve the pure whiteness of their wool, that they did not trust to the colour of the fleece alone, but carefully examined the mouth and tougue of the ram; and if the least blackness or swarthiness appeared, he was immediately rejected from the flock, that he might not communicate the colour to the fleeces of the lambs.

"Illum autem, quamvis aries sit candidus ipse,
Nigra subest udo tantum cui lingua palato,
Rejice, ne maculis infuscet vellera pullis
Nascentum.——Geo. III. line 387, &c.

Letter to Mr. Bakewell, from a friend, June 9, 1808:—"In conversation with Capt. Goodall, whose connection with St. Domingo you may have learned from the newspapers, he mentioned some particulars respecting two ewes, which corroborate the opinion that you are going to publish upon the effect of excessive heat on the fleece. These animals, soon after their arrival on the island, became languid and sickly, lost their wool, and in twelve months a harsh, sparing crop of hair was observed on them."

Lord Somerville's account of the effect of heat on the wool of his merino flocks, even in our temperate climate, is a farther illustration of this truth. The practical inference to be made from both these instances, is obvious. It evinces the advantage which must arise from keeping sheep in cool and shady situations during the heat of summer, particularly after the time of shearing. The natural instincts of the animal, if attended to, would teach us the propriety of providing the flock with a shade and defence against the fervid rays of a meridian sun in the three summer months.

The experiments of M. Ivard, in 1800, made in France on four merino sheep, tend to prove, that where the fleece is suffered to grow more than one year, the quantity of wool produced is less than when the animal was shorn twice in the same time. These experiments agree with the observations of M. Fink, made in Saxony, and accord with what takes place on almost every other breed of sheep on which the same experiments have been made. They are however at variance with the results of M. Gilbert's experiments on a part of the merino flock at Rambouillet. The method adopted by M. Ivard, appears from its accuracy to have the preference.

A Remedy for the Canker and other Wounds in Trees.—The damaged parts of the tree must be cut or peeled off in the spring, and the places must be rubbed in a fine sunny day with turpentine, which becomes a sort of varnish, so that the wounds will be hermetically closed, and the tree will speedily recover. By this simple and cheap remedy many trees have been already saved, which in the spring showed symptoms of decay. Even all the upper part of the bark has been cut away, and in the space of a year an entire cure has been effected.

Mr. Burrows, of Weasingham, England, lately produced twelve tons per acre from sixteen acres of carrots at a cost of £176, or £11 per acre. He then fed twenty-eight cart horses with them for sixteen weeks, at two bushels each per day, mixed with a quarter of a peck of oats; and on a comparison of food in hay and oats, he found that the same horses, in the same time, would have consumed the produce of forty-two acres, being a saving of twenty-six acres in sixteen weeks.

NOTICE TO CORRESPONDENTS.

The late communication of the inventor of a machine for irrigating lands, marked $\underline{\Lambda}$, is received. The Trustees will be happy to learn the result of the experiment he is about making.

PREMIUMS

OFFERED BY THE TRUSTEES OF THE MASSACHUSETTS SOCIETY FOR PROMOTING AGRICULTURE.

1. To the person who shall have raised within two years from the first day of June, 1814, the greatest quantity of woad within this Commonwealth, not less however than three hundred pounds, and shall produce to this Board specimens of the same, provided the quality thereof be good, a premium of *one hundred dollars.*

2. To the person who shall within three years from the first day of June, 1814, produce a specimen of madder of good quality of his own growth, and who shall have actually raised the greatest quantity thereof, in this Commonwealth, being not less than 1000 pounds, a premium of *one hundred dollars.*

3. To the person who shall invent the most approved machine for thrashing or separating grain, (regard being had to it fitness for a medium farm,) a premium of *one hundred dollars;* to be claimed on or before the first day of June, 1816.

4. To the person who shall invent the best and cheapest machine for cutting *straw* and *corn stalks*, (as fodder for cattle,) which shall admit of the application of horse power, a premium of *seventy-five dollars;* to be claimed on or before the first day of June, 1816.

It is required that the communications, for which the foregoing premiums are offered, be accompanied with proper certificates from the selectmen, magistrates, or clergymen of the vicinity, or other vouchers, to the satisfaction of the Trustees; that they be delivered without names, or any intimation to whom they belong; and that they be severally marked in such manner as each claimant shall think fit; the claimant sending also a paper, sealed up, having on the outside a corresponding mark, and on the inside his name and address.

RICHARD SULLIVAN, *Recording Secretary.*

ERRATA. (No 1, Vol III.)

Page 59, line 14, from the top, between the words, *from hundred*, insert the word *one*.

58, — 28, from top, between the words, *again produce*, insert a semicolon, ;

60, — 17, dele the word *this*, and insert *their*.

60, — 23, dele the *s*, at the end of the word *furrows*.

60, — 29, between the words *plough with*, insert the word *in*.

65, — 6, from the bottom, add an *s*, to the end of the word *time*.

66, — 11, from bottom, dele the *s*, at the end of the word *operates*.

In No. 2, Vol. III.

Page 95, line 13, from top, for *sonsidered*, read *considered*.

98, -- 10, from top, for *Mons. Ican*, read *Messire Jean*.

106, -- 4, from bot. between the words *should be*, insert the word *previously*.

107, -- 1, at the top, dele the word *seed*.

107, -- 15, from the top, dele the word *two*, and insert the words *four or five*.

107, -- 21, from the top, after the word *be*, add the word *put*.

110, -- 10, from bot. for *Crotolaria*, read *Crotalaria*.

128, -- 5, from bottom, dele the *s*, at the end of *Agrostiss*.

129, -- 9, from top, for *Migra*, read *Nigra*.

130, bottom line, dele *en* once in *arvensis*.

131, line 2, from top, for *Hordium* read *Hordeum*.

147, -- 10, from top, for *Swannerdam*, read *Swammerdam*.

147, -- 11, from top, for *Scheiac* read *Scheirac*.

161, -- 11, from bottom, for *bed*, read *been*.

167, -- 7, from top, for *top* read *tap*.

173, -- 15, from top, for *Perbendary*, read *Prebendary*.

MASSACHUSETTS

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ESSAYS

ON THE NATURAL HISTORY AND ORIGIN OF PEAT.

BY ROBERT RENNIE, M. D. *of Kilsyth in Scotland—Abridged for the Massachusetts Agricultural Journal, by the President of the Society.*

[The subjoined article, which treats of Peat and the several varieties of Mineral Coal, is of greater length than can be acceptable, we fear, to many readers, in a work of this kind. But on the other hand, every one will be ready to acknowledge that he has occasionally experienced no inconsiderable disappointment and vexation from the common practice adopted in periodical works, of publishing a part only at a time, of an elaborate but interesting essay, or some narrative, and being obliged to defer the gratification of curiosity or the thirst for knowledge, until the appearance of another Number. As respects the following Abstract, we think the importance of the subject entitles it to the space which has been given to it. We ought not to forget how much the sufferings occasioned by the scarcity of fuel, during the late war, might have been alleviated by a more general use of Peat, to which many more people would have had recourse, could the knowledge relative to this species of fuel contained in this treatise have been earlier diffused through the country.

It gives the necessary information for a just estimate of the value of our peat bogs—the proper instruction as to the several varieties of peat—their comparative richness, as fuel, and the distinguishing marks of each. A close affinity is traced between these and the mineral coal; and the vegetable origin of both is satisfactorily proved.

We are sensible that this essay is more scientific, than we could wish, considering that the objects of the Society are to give information to cultivators generally. But the subject being one of great im-

terest to the public at large, we have thought it our duty to present it to our readers. If we had possessed in this part of our country a Journal devoted to chemistry or physical science, perhaps it would have found in such a Journal a more appropriate place. As this is not the case we present it entire in the Agricultural Journal. We hope to be able by the assistance of Agricultural Societies throughout the State to make our publications interesting to all descriptions of cultivators.]—PUBLISHING COMMITTEE.

Introduction.

THE following extracts are from a number of Essays, dedicated to the President and Members of the Board of Agriculture, established by the Government of Great Britain, on the important subject of reclaiming Peat lands for agricultural purposes, or preserving them and increasing their growth for fuel, as a substitute for wood and earth coal, by the Rev. Dr. R. Rennie of Kilsyth in Scotland. He considers the natural history of Peat, or what is generally denominated Moss on the continent of Europe, as a substance that has been generally neglected, previous to his undertaking it. He has published two volumes on this subject and promises a third. The work contains many repetitions and similar opinions of a number of philosophic gentlemen in different parts of Europe, especially the celebrated De Luc of Geneva. This work describes every variety of coal, as having been formed from the same materials as peat, and shews the alliance so clearly, as to draw a fair conclusion that the coals are only a more complete bituminization of Peat, and are easily traced to a vegetable origin. He makes five distinct varieties of coal: the first, he calls Bovey coal, which contains some vegetable matter, not completely bituminated, and seems to be the first grade from peat; the second variety, he calls Surturbrandt coal, which is distinguished from other coal by its containing the perfect form of the ligneous vegetable, and often one part of a tree is completely formed into coal while the other part remains wood; the third variety is called Pit coal, in which many parts of the vegetable may be traced, but is entirely bituminized, which is the case with Jet, though he considers this variety as the most perfect; the fifth, he calls Blind coal, which appears to be almost pure carbon, without any bituminous matter mixed with it.—Hence it is not inflammable but by the aid of some inflammable

substance and a strong current of air, the oxygen of which parts with its heat which becomes intense and joins the carbon, and flies off in carbonic acid gas—it consumes very slow, from the compact nature of the coal. All these inflammable substances are formed from vegetables submersed in stagnant water, in a temperature so slow as not to admit of fermentation, but only a solution and union of the hydrogen or inflammable part of the vegetable and its carbon, which appears to be the origin of all bitumens. Most peat ground may be converted into the richest soils, by completely draining the water and exposing the surface to the air and sun, when it is not wanted for fuel. A chemical decomposition takes place by a warm temperature and the gases pass off into the air, and the best vegetable mould is formed. In the northern parts of this country peat is undoubtedly formed in abundance, prepared by nature for fuel. Perhaps under the masses of peat, in our boggy lands, that produce nothing useful for animal food, may be found coal of the best kind, though no doubt deeply immersed in water; and in the present state of the country, it may be found too expensive to bring it into use. Peat completely formed for fuel becomes every day more important as wood decreases. Our shaking meadow lands, that produce coarse grass hardly fit for use, on examination are composed of a deep half liquid matter, which will be found to contain the best materials for fuel. In many places through which the Middlesex Canal passes these bogs are from twenty to fifty feet deep. If in this state the matter is drawn out with tubs or any machinery and dried on the surface about six inches thick, when partly dried, cut into squares of from four to six inches, it will be found nearly equal to sea coal for any use. There is undoubtedly a plenty of good peat, without using any of the top of the ground, (which is loose, spongy and half formed,) enough to last the country for centuries. The light parts or tops should be thrown back into the pit, after that fit for use is taken out; it will with the aid of aquatic plants be soon converted into good peat by the silent process of nature. No peat ought to be dug for fuel that is not when dried hard and heavy. Some roots will appear in such peat, but it ought to be considered good for fuel possessing these qualities, and of more importance than to use such land for agriculture. The Irish have long since determined that their peat bogs are of more value for fuel than they ever can be in a state of cultivation. These extracts have been

made with a desire to communicate to the public the nature and varieties of peat and the inflammable substances contained in the earth derived from vegetable matter, and to shew its uses for fuel or cultivation; which I submit to the Trustees of the Massachusetts Society for Promoting Agriculture to republish, if they think them of sufficient importance.

AARON DEXTER.

Though peat exists, nay abounds, in every region of the north of Europe and America; though it is every day under the eye of the philosopher, the natural history and origin of this substance has been neglected for ages.

Lentilius and Commelinus suppose that Holland at one period was an extended forest, and that this was overflown by an inundation of the ocean; that of course the wood, thus overset, sunk in the mud, and by the accession of particles of earth deposited by the waters, formed the immense mosses of that country.

Moisture seems to be absolutely requisite to the formation of peat from these materials. Let a congeries of ligneous or aquatic plants be formed, if left dry, or not immersed in water, it never will be converted into peat. Such a mass indeed will, even in this case, undergo certain chemical changes, and form new combinations, none of them will be found to have the characteristic qualities of peat. When exposed to the influences of the atmosphere, it will undergo the putrid fermentation, and be reduced to vegetable mould; in this form it will be destitute of the distinguishing qualities of moss or peat, inflammability, tenacity and others. It is known, that all the deep mosses in Europe lie on level plains, where water must have stagnated; the very word moss, or peat, in the original Celtic language, implies this.

The subsoil of most mosses or peat is impervious to water; it generally consists of a stiff tenacious clay. Sometimes sand may be discovered under that substance; but though it forms the immediate subsoil, below it will be found a bottom of clay.

When peat is drained, it ceases to grow; the aquatic plants which furnished the materials for its original formation and subsequent increase no longer flourish, of course no addition to the peat is made.

But moisture alone is not sufficient for the formation of peat; it is further requisite for this purpose, that the water, in which it is immersed, be stagnant.

Most of the plants which contribute to the formation of *moss* or *peat*, are possessed of astringent, antiseptic juices, soluble in water. When such plants are therefore immersed in that liquid in a stagnant state, these juices must be diffused through it; of course it must be changed in quality, and differ from rain or river water. When a quantity of oak leaves, or bark, or wood, or even aquatic plants, drop into a pool of stagnant water, a change of colour ensues, and it acquires a bitter astringent taste, and an antiseptic quality. Aquatic plants, such as abound in peat, may flourish even in such a liquid, though no succulent herb will. By this means, a mass of vegetable matter may be accumulated, and, in the course of ages, that matter may be converted into peat, and still the water may possess the same astringent antiseptic quality; accordingly, it is a well known fact, that, in this respect, peat water differs from rain or river water, the latter when it is allowed to stagnate, especially in warm weather, becomes putrid; the former does not. Peat water converts all the vegetable matter immersed in it into moss, or peat. This is not the case with rain or river water.

Besides all the above requisites, a low temperature seems to be necessary to the formation of peat. It is superfluous to offer any proof of this, one fact is sufficient to establish it, viz. that no peat exists in warm climates, except on high mountains. It has seldom, if ever, been discovered between the tropics.

The only decisive evidence that the northern parts of Europe and Asia are colder now than at some former period is, that trees are dug out from under the perpetual snows of Lapland and Iceland, and even on the summit of the Alps and Pyrenees. That these trees grew on the spot where they now lie, cannot be doubted; and that no tree, nor vestige of vegetation, can now be traced in these regions, is equally certain. At the period, therefore, in which these trees sprung up and flourished, the temperature of the northern regions and lofty mountains must have been much milder than now, but that period seems to have been far more remote than the Saxon or even Roman age.

As vegetables, while placed in a vacuum, or secluded from the atmosphere, or the oxygen it contains, are not liable to the putrid fermentation, so neither can that process go on in a mass

of vegetables immersed in peat water or in a lake. In this situation, there is a superabundance of moisture, and as vegetable matter, when kept continually dry, does not undergo fermentation, so neither can that process take place, when there is a superabundant moisture, especially when there is no alternation of moisture and drought.

It is true, a considerable proportion of all vegetables, even of those ligneous plants, which are the most solid and compact, is soluble in water.

If the hardest and most compact wood be partly soluble, it is obvious, that a greater proportion of those plants, which are of a looser texture and contain a little or no ligneous fibre, must be capable of solution in this medium. The juices of many of these vegetables, it is known, may be speedily dissolved or diffused in water; the carbonic and gallic acids, and also tannin, which they contain, are of this description.

The same is the case in all lakes. Even in Italy and Switzerland, Peron found this was the case. Georgy, Gmelin, Pallas, Leydyard, and Patrin, observed that the lakes of Siberia, at a certain depth, were of the same temperature. At the same depths in the lakes of America, the temperature was observed to be the same, by Shaw and M'Kenzie. The ocean too, in all latitudes, whether in the torrid or frigid zones, has been found to be of a low temperature, at a certain depth; Irvine and Phipps examined it at 80° north latitude. Forster did the same in the opposite hemisphere, in 64° south. Peron examined it under the equator, and the result of these experiments on this extended scale was, that at a certain depth, the temperature of the sea was in all latitudes nearly the same, and uniformly low. In all these cases, the thermometer sunk in proportion to the depth. Forster found, that Reaumur's sunk from 16° to zero. Irvine says that it sunk 2° below zero at the depth of 3900 feet. The experiments of Ellis and Wallis, Bragley and Baldh, confirm the above account. The conclusion is obvious, that in the profound abyss of the ocean, even in the warmest climates, as well as on the summits of the lofty mountains, a low temperature uniformly reigns; and as few vegetables or animals can exist on the latter, so the former are probably destitute of fishes, as both are exposed to the same intense cold, and perhaps bound in perpetual ice.

The temperature of the mosses at the depth of two or three feet is almost uniformly low; it seldom exceeds 48°. Or if it rise above this, which is very seldom the case, it is owing to certain chemical agents, accidentally combined with the mass. If this point be established, we may more distinctly ascertain what are the chemical changes which vegetable matter undergoes, in such a medium and at a temperature so low. It is obvious to demonstration, there is a want of a sufficient degree of caloric, to carry on and complete the putrid fermentation; that process is arrested, in its primary stages, owing to the absence of this universal and powerful agent. The volatile particles of that matter can never assume the gaseous form, or be evolved at a temperature so low. It cannot be doubted, that the elements of vegetables, may be set free from their existing combinations, even in such a medium. In the slow and silent process of nature too, they may combine anew, the oxygen of the water may combine with different bases to form acids; the hydrogen also may combine with the carbon to form oils, and these oils may form triple combinations with oxygen or acids, so as to assume the more concrete form of bitumens; but none of these simple elementary constituents, nor the compounds they form, can assume the gaseous state; no evolution of these can, therefore, take place in a temperature so low.

The residuum of vegetable matter, in the medium of water, must be very different in its chemical qualities from that of the same matter in the medium of the air; in the latter case, it must undergo all the stages of the putrid fermentation; and during that process, the vegetable acids, oils, gums, and resins, must disappear; the elementary principles that are volatile, must escape in the form of gas. In the former medium, and at a temperature so low, no such process can be accomplished, and no such evolution can take place. Though the same vegetable acids existed in both, and though the carbonic acid may be formed in the medium of water, as well as in air, that acid is not evolved, nor does it assume the gaseous form till the temperature rises considerably. It is never entirely dissipated from vegetable matter, till the temperature reaches to 80°. The hydrogen and carbon of vegetable oils is never discharged, in the form of gas, till the temperature rises as high, or higher, than the latter. As moss seldom or never rises above 48°, excepting on the surface, it must, therefore, still possess all these

elementary principles and differ essentially, on this account, from vegetable mould, though it be originally composed of the same materials.

It must be more inflammable, because it contains more hydrogen and carbon; it must be possessed too of more acidity, as the vegetable acids have not been expelled, and it must be more tenacious and insoluble when dried, in consequence of the combinations formed by these elementary principles. These are, of course, the very qualities by which moss is distinguished from vegetable mould, and these qualities depend on the medium and temperature in which the vegetable matter has been placed. It is true, indeed, that the surface of all moss is exposed to the alterations and transitions of the climate and all the influences of the atmosphere; but it is equally true, that in all latitudes where moss is found, it is, on this very account, unfit for fuel; it is never so highly inflammable as the rest of the moss which lies deeply immersed; it is certain, that in those climates where a high temperature reigns, or where the above alterations are great and rapid, the surface of the peat is useless to a greater depth as a fuel than in colder regions, where such alterations are not so great or rapid. In a low, warm sheltered valley, there is a greater depth of surface deprived in a great degree of inflammability, than on lofty mountains in the immediate vicinity. In the north of France, the surface is more inflammable than in the south, yet, even in the latter, fifteen inches below the surface, moss is found possessed of all its distinguishing qualities.

The reason of this seems to be, that at the above depth it is not exposed to the high temperatures of summer and to the sudden transitions of heat and cold of the other seasons, which would be sufficient to make the hydrogen and other volatile particles assume the form of gas; therefore the putrid fermentation is not completed, as it is nearly on the surface.

One circumstance more may be mentioned on this point, viz. that the more loose, open, and porous, the surface of any peat is, it must be deprived of inflammability by the above means, to a greater depth; on the contrary, such as are solid and compact and almost as hard as coal on the surface, must be less exposed to the above agents. It is certain, however, that even coal itself, when exposed to the air, is, in course of time, stripped of its inflammability, or oxygenated as well as peat.

When a mass of vegetable matter is thus secluded from the influences of those powerful agents which promote and accomplish the putrid fermentation, when it is shut up from access to the atmosphere and the oxygen it contains, when it is overcharged with moisture and never exposed to a sufficient degree of caloric, nor to those transitions which have been spoken of, that process cannot be completed.

In general, it is obvious that in such circumstances, there can be little or no evolution of the volatile particles of vegetables in a gaseous form ; the residuum, therefore, must be very different from that of the same vegetable matter exposed to the atmosphere, and all the chemical agents to which it is exposed in that medium.

In the first place, less of the carbonic acid which that matter contained, can be evolved in the medium of water than in that of the atmosphere ; in the latter stages of fermentation, that acid is almost entirely expelled. But it is only in the ultimate stages that this takes place ; in the commencement of it no such evolution is accomplished, nor can it be till the temperature is raised to a considerable height. From the foregoing statement it appears, that moss peat or vegetable matter, immersed in water, seldom or never rises to this pitch ; of course, this acid never assumes the gaseous form, on account of the low and equable temperature in which it is placed. On the contrary, having a strong affinity to water and being soluble in it, it must be diffused through and incorporated with all the mass of vegetable matter that comes in contact with it.

The mosses and mossy lakes are all strongly impregnated with carbonic acid. By the rays of the sun, the oxygen it contains being set free, the soluble carbon is of course precipitated. Uniting with the hydrogen, to which it has a powerful affinity, it must form a kind of oleaginous, inflammable matter. The fine soft pulpy substance, found at the bottom of such lakes, and so highly inflammable, is probably formed in this manner; hence it is destitute entirely of organization.

That this process is going on in lakes and marshes, we may learn from the following circumstance. It appears that aquatic plants, even in a growing state, and immersed in water, are robbed of their oxygen by the light of the sun. It rises, of course, in bubbles to the surface ; if a cloud intervene or night ensue, this operation ceases. The quantity of oxygen which they yield

is in proportion to the carbonic acid contained in the water or the plant, and the length of time to which they are exposed to the light.

By the above changes and combinations, there must be a constant accession of hydrogen; for, while these aquatic plants discharge oxygen in the light, they greedily absorb and retain hydrogen. Rosier observes, that this is a wonderful provision in nature; by the exhalation of the former, and absorption of the latter, the air of such mosses is always salubrious; for, as the carbonic acid is not evolved, on account of the temperature of the moss being low, so neither is the hydrogen. By this means, the air is never infected with these deleterious gases.

Carr, in his Stranger in Ireland, mentions, that this is the case in that country. Dr Walker makes a similar remark; he says, "stagnant rain water, especially in warm weather, occasions in fenny countries intermittent fevers and putrid diseases; whereas, no such effects are felt from stagnant moss water." The moors and mosses in Scotland, and the turf bogs in Ireland, are inhabited by as healthy people as any in the world. No intermittent fevers, no putrid sore throats, prevail among them. M. de Luc makes the same remark; he says, "Over the whole continent of Europe which I examined, the air of the mosses, even in the lowest vallies, is very salubrious; the inhabitants of these districts are remarkably healthy—they are not liable to the *fever and ague* which prevails in other low level lands in their immediate vicinity, where there are no mosses." The oxygen they discharge must purify the air, and promote the health of those who inhabit such districts.

In warm climates where the putrid process goes on with rapidity no peat is ever formed, though the same materials abound, and the air is for the above reason noxious, and the inhabitants a sickly race of beings. Rosier observes, "that in Bresse Bressante, the oldest man in a parish does not exceed fifty years."

Dr. Jackson, in his account of the fevers that prevail in Jamaica, makes a general remark to the same effect; he says, "in warm climates, especially in the heat of summer, the air of low marshy lands is pestilential;" this he ascribes to the exhalation of noxious gases, during the process of the putrid fermentation. Hence he observes that some districts are healthful in winter and autumn, which are absolutely pestilential in summer.

As peat exists only in the temperate and frigid zones, as it is uniformly in a low temperature, no such consequence can take place. No such deleterious gases are discharged; of course, the air is uniformly healthy. Such seem to be the changes and combinations, which vegetable matter undergoes in the medium of water. By these means, the elementary principles of that matter must be set free, and again combine anew. On this account, it is natural to suppose, that, as few or none of these are dissipated in gas, we may expect to find them all in their simple or compound state in peat. Where fuel of all kinds is scarce, and little or no coal is found, it is of vast importance to prevent the waste, and promote the renovation of peat moss. The north of Scotland and the whole kingdom of Ireland, are of this description. In the former, no coal has hitherto been discovered; and in the latter, it is only found in one or two districts. The value of peat, as a fuel, to both these parts of the empire is great, and it must appear still greater, when it is considered that there is at present a scarcity, even of that article, in many parts. "Fuel is so dear, in the province of Ulster, that while peat can be got for that purpose, it cannot be worth any man's while to employ moss or peat land for the purpose of agriculture." The same scarcity of fuel seems to be felt in the south as in the north of Ireland. The secretary of the Cork Institution mentions this in one of his letters; "we have no bogs in this country which we wish to be reclaimed, as they are barely sufficient for fuel."

Peat ought never to be dug in forests, or open casts; for, in this case, when the water is drained off, there is no renovation of peat. It ought always to be dug in pits, and the smaller these pits are, the more rapid is the process of renovation. These pits should never be left dry; the moment the peat is dug, they should be allowed to fill up with peat water. Without this, there can be no renovation of that substance. In digging the pits, care should be taken to leave a little peat in the bottom—in no case ought the subsoil to be left bare. In every situation where moss is renovated, this rule holds true, that when the water is only shallow, (i. e. about two feet deep) the renovation of peat is more rapid than when it is deeper. No current of any kind ought to be allowed to pass through these pits.

After the whole moss is pitted, the interstices, or subdivisions, may then be cut into peat; and before this be exhausted, the

new formed peat will be ripe, and may be cut in the same manner.

By following these simple and obvious directions, a peat bog may be used as a copse of wood, and furnish a perpetual supply of fuel to succeeding ages.

The dark coloured compact peat, in which no organization of the original vegetable can be traced, may have led some to conclude, that the putrid fermentation has taken place in that species—the decomposition is indeed complete—and the elementary principles of which it is composed may have been as completely separated, as if it had been analyzed by distillation, or putrefaction; still it does not follow that it has undergone the putrid fermentation. For the great, the necessary agents in that process have been wanting; the influences of the atmosphere, and still more, the degree of caloric, and the alternations requisite to carry on and complete this fermentation, have not combined with the peat, or co-operated to effect such a change.

Mr. Parkinson calls it a fermentation peculiar to vegetable matter, placed in such situations as not only to exclude the external air and secure the presence of moisture, but to prevent the escape of the more volatile principles, and which terminates in the formation of those substances called bitumen. The oxygen of the carbonic and gallic acid, being attracted by the light of the sun and other agents, the carbon they hold in solution may be thus set at liberty. This carbon has a powerful affinity for hydrogen; and uniting with it, a kind of oily compost may thus be formed. A third combination occasions another change; for when oxygen combines, it gives this oily compost the concrete form of bitumen. This oxygen may be furnished by the decomposition of the water, or the acids with which it is impregnated. Thus the result of the whole will be a black insoluble compound, destitute of organization, but highly inflammable. The black pulpy peat at the bottom of lakes and marshes, (which by some has been called perfectly putrid) seems to have been formed by this or a similar process, and this appears to be the first stage. Aquatic plants promote the formation and renovation of peat. No doubt the formation of moss is going on during the growth of such plants; as however, those plants and that water, which contains the greatest proportion of the above acids, emit more oxygen, and of course yield more soluble carbon; and, as these acids are continually accumulating by the

rapid growth of such plants, this process must become proportionably more rapid ; for, when the waters become doubly astringent, they must yield a double proportion of materials for the formation of moss in a given time.

Ligneous plants contain nearly a fifth part of their weight of carbon. Even in aquatic a considerable proportion exists in both—it is the same elementary substance. Being nearly incorruptible, it must therefore abound wherever vegetables are decomposed ; and where that decomposition is complete, and the organization of that vegetable matter is totally destroyed, (as is the case in some kind of peat) the whole of the carbon of the recent vegetable must be deposited. Though set free from its former combinations it is not evolved, it must therefore form the chief ingredient of such a mass. Hydrogen also exists in every vegetable—it constitutes one of the elementary principles of all the essential oils, gums and resins of every plant, whether ligneous or aquatic. Being specifically much lighter than atmospheric air, it is apt to assume the form of gas. In this form, part of the hydrogen of the recent vegetable in peat may have escaped, but immersed in water, and placed in a low temperature, the proportion that is evolved must be small—by far the greater part must remain.

On the surface of peat, the organization of the plants of which it is composed is often entire. That organization becomes fainter and fainter, as we dig down to the bottom, where it almost or altogether disappears. Though few substances are more dissimilar in appearance, than the fibrous peat on the surface, and the solid black peat dug out from the bottom, this is no proof that they are of different origin. On the contrary, as the former is altogether composed of vegetable matter, it appears reasonable to conclude, that the latter may be traced to the same source ; more especially, as the most compact peat, when diluted in water and examined by a microscope, discovers the most distinct traces of its fibrous texture. Though the origin of the latter appears doubtful, as that of the former is decisive, it is more reasonable to ascribe both to this source, than the one to vegetable, and the other to mineral origin.

If vegetable matter be detected, even in the most compact peat, in a distinct state of organization, it is as reasonable to conclude that this species is of vegetable origin ; as the most fibrous peat, in which every plant, of which it is composed, may be found

in its original organic form. But if this position be well founded, and if this analogical reasoning be conclusive, it may be pursued much farther than in peat moss. For surturbrandt coal, and even jet, often contain vegetable matter in an organized state: we may therefore, on this account, trace them to the same source. In these substances, indeed, the traces of vegetable matter are fewer and less decisive; for peat is obviously of more recent origin than any of these substances—its origin and natural history must therefore be preserved. The records of the other bituminous substances mentioned must be lost in the lapse of time. The general hypothesis is, that there is a clear and decided alliance between peat, surturbrandt, coal, and jet.

Surturbrandt and Bovey coal certainly constitute a species of matter different from peat moss: they have therefore generally been supposed to be of mineral origin. The alliance between them and peat has never been distinctly traced. Some distinguished authors seem even to doubt of this alliance.

Other authors have supposed that Bovey coal belongs partly to the mineral and partly to the vegetable kingdom. Brochant, in his mineralogy, seems to maintain this opinion. He says, that "it is half mineral and half vegetable;" and he adds, that "Walter calls it *vegetabile fossile bituminosum*. Brongniart thinks that "it is more a vegetable than a mineral substance." He observes, "that it ought not to form a variety in the system of minerals, if it did not, by insensible degrees, graduate into those varieties which precede and follow it"

This insensible gradation is one of the most interesting and curious subjects in geology; but it appears to be no conclusive argument against the vegetable origin of Bovey coal. On the contrary, as the same gradation may be observed in peat moss, it seems to corroborate this conclusion.

Bovey coal seems only to be advanced one step further than compact peat, in the process of bituminization. The former often bears more evident traces of vegetable origin than the latter. In the former, these traces are so palpable and frequently so obvious, that they can be clearly seen by the naked eye; in the latter, the organization of the vegetables of which it is composed is sometimes so entirely gone, that it can only be detected by the aid of a microscope.

This however is not always the case. In some specimens of Bovy coal there are no traces of vegetable organization, though

in others they are obvious and entire. Werner accordingly supposed that there were two distinct species of that substance. Brochant however observes, "that they are linked together by such an insensible gradation, that the one is only a modification of the other." In this respect there is a general alliance between peat and Bovey coal. In both there are the same gradations and in both the same difference. Compact peat bears the same resemblance to fibrous, as Bovey coal, with organized vegetables in it, bears to that which contains no vestige of organization. But this alliance may be traced still more clearly; for if it can be shewn that wood is detected in Bovey coal, in its original organic form; if all the different parts of ligneous plants, such as the roots, stems, branches, bark, leaves, and fruits, be detected in Bovey coal as well as peat; still more, if part of the same tree has been discovered in its original state, and another part be converted into Bovey coal, and if similar aquatic as well as ligneous plants have been discovered in each of these substances, the alliance that subsists between them must appear obvious.

The wood of which surturbrandt seems to be composed is often, if not generally, found in its original organic form. The annual rings, which mark the growth of the original plant, may often be traced These always assume the elliptical form; this may be owing partly to compression. And no Bovey coal has been discovered, but what has obviously been subjected to mechanical pressure from the superincumbent strata uuder which it lies. It is, however, principally owing to chemical causes; the wood has probably undergone certain changes, by which it has been softened so as to yield to compression. Trees are often discovered in peat moss in this soft plastic state; they are so changed by chemical agents that they are nearly as soft as a piece of peat; and if such trees were exposed to similar pressure with that to which all Bovey coal has been subjected, they would certainly assume the same elliptical form.

All the different parts of the original wood have been detected in surturbrandt. The roots, stems, branches, knots, bark, even the leaves, have been found in an organized state. Professor Hollman speaks of many specimens of this description, that have been dug up near Munden. He says, "the distinct traces of the very leaves were visible." M. de Luc mentions, "the wood dug out of Messner resembles in every

respect that which may be found in a ruined forest, or is dug out of peat bogs. I have seen these trees in large heaps, lying on the spot. The stems, branches, and roots, may be distinctly seen."

Sometimes part of the same tree is found in its original state of wood unchanged, while other parts of it are so highly bituminated and so much changed, that they can scarcely be distinguished from coal, excepting by their organic structure. Bomare mentions an oak tree, found in digging the foundation of the walls of Nanci, fifty feet long and five in diameter. He says, that it was as black as ebony, yet very sound, excepting some knots which were changed into a kind of fossil coal.

The traces of aquatic plants are visible in surturbrandt, or the strata that accompany it, as well as in peat. Parkinson observes, that "the clay or schistus, which intervenes between the strata of Bovey coal, is often found to contain vegetable impressions of reeds and grasses."

These are some of the aquatic plants that enter into the composition of peat moss. If these facts be well ascertained, no doubt can remain of the vegetable origin of Bovey coal and its alliance, in this respect, to peat moss. The chief difference between these two substances seems to be, that the former contains chiefly, if not solely, the remains of ligneous plants; and that these are more completely bituminated and consolidated than the latter. In all other respects the resemblance is so obvious and entire, that little doubt can remain of their being formed of the same materials, and by a similar process. To ascribe the one to vegetable, and the other to mineral origin, would therefore appear unreasonable.

Pit coal appears to be the next in the order of bituminated substances. In many respects it is homogeneous with peat and surturbrandt; and there are strong reasons to conclude, that it also is of vegetable origin. A few facts and circumstances which lead to this conclusion, may be mentioned; many others must occur to the intelligent reader. And it is believed that no solid objection can be stated against this hypothesis, which may not be obviated on similar principles as those respecting the origin of peat moss.

The traces of ligneous plants are frequently detected in the strata of coal itself. Specimens of this kind may be seen in the cabinets of the curious; and there are very few coal strata

utterly destitute of them. The conclusion from this is obvious, that ligneous plants have existed in, and contributed in part to, the formation of coal as well as peat.

Mr. Williams who had the best means of information, and the most extensive opportunities of examining coal mines, is decidedly of this opinion. He says, that wood " is so obviously the origin of coal, that he could almost trace and point out the particular species which furnished the materials for varieties of that substance."

As wood has been discovered which was partly converted into peat, so have similar specimens been found in coal. Mr. Playfair, in his luminous work, mentions that in the Isle of Skye, pieces of wood have been found, one end of which remained still in its original organic shape, and the other had been converted into coal, in which there was no vestige of organization. Mr. Brand, in his history of the antiquities of the town of Newcastle, speaks of similar specimens that have been found in Ireland. He says, that " the top of the tree was still wood, while the bottom or root was converted into coal."

Some ligneous plants have been discovered in such an entire state of preservation in that substance, that the species to which they belonged could be ascertained. Chaptal says, that " the bamboo and banana tree have been detected in the coal of Alais."

All the other parts of ligneous plants, as well as the trunks and roots, have been discovered in a state of partial or total bituminization. The bark of trees appears to undergo this change sooner than the trunk ; of course, it is for the most part converted into coal, even while the trunk remains entire. Yet in some instances, in coal as well as in peat moss, the bark is found in its original organization. Mr. Brand mentions an instance of this ; while part of the tree was converted into coal, the bark was found adhering to the other part. The leaves are still liable to change.

If the above facts be correctly stated, we must conclude, that the tenderest and most delicate parts of vegetable matter may be detected in coal as well as in peat ; nay, more, that these have contributed to the formation of the former as well as the latter. This corroborates the general conclusion, that coal is of vegetable origin.

Mr. Hatchett observes, that " next to the ligneous part, the resin of trees is that substance which most powerfully resists

any change; but when this change is effected, it is the substance from which bitumen is more immediately formed. It not only contains the greatest proportion of the elementary principles of that substance, but it is nearly allied to it; the resin that remains in its original state in the resino-bituminous matter, above mentioned, must be regarded as a part of the proximate principles of the vegetable, which has not yet undergone the necessary change. The bituminous matter, on the contrary, seems to be the product of the same principles, after this change it accomplished."

This appears, therefore, to be the link which unites bituminous to vegetable, or it is the link which unites the vegetable with the mineral kingdom. It therefore claims more particular attention. That attention has been paid to it by the justly celebrated Mr. Hatchett. His experiments set this point in the clearest light, and establish the affinity which exists between bitumens and the recent vegetables.

If we thus discover a vegetable substance, which appears to be in a progressive state of bituminization, this becomes a presumptive proof, that all bitumens are of vegetable origin; not only those which contain organized vegetable matter, but even those where the organization is destroyed. The resins and gums of trees may have furnished materials for the latter, while the fibrous woody part has contributed to the formation of the former.

The gradation may be traced distinctly in all its stages. In Bovey coal, and especially in the substance which accompanies it, nature seems only to have performed one half her work; one half nearly being still a vegetable resin, and the other a bituminous substance. In asphalt that process is still further advanced. In cannel and pit coal it is nearly completed, and in the elastic bitumen of Derbyshire no trace of vegetable resin can be discovered.

The next in the order of bituminous substances is jet. The alliance between it and peat is a step further removed; it must therefore be more difficult to trace it clearly, as in peat moss, the deeper we dig, we generally discover fewer vegetables in an organized state, and its origin becomes less conspicuous; so is it in other bituminous matter. In surturbrandt it is more obvious than in coal, and in coal still more obvious than in jet; yet even in this last substance, where the change is most complete, we may discover distinct traces of its vegetable origin.

As in peat, surturbrandt, and coal, trees have been discovered, partly changed into these substances, and partly in an unchanged state; so the same discoveries have been made in jet. Chaptal mentions an instance of this; his words are, "I preserve in the cabinet of mineralogy of Languedoc, several pieces of wood, whose external part is in the state of jet, while the internal part still remains in the ligneous state; so that the transition from the one to the other may be observed."

It is, if possible a still clearer evidence of the vegetable origin of jet, that specimens have been discovered, in which one end of the same tree was converted wholly into jet, while the other remained in its original state. Fourcroy mentions instances of this; and Chaptal says, that "in the environs of Montpelier, several cart loads of trees have been dug up whose form was perfectly preserved, though entirely converted into jet."

Utensils of wood have been discovered converted into jet. "I have," says Chaptal, "found a wooden pail converted into this substance." He likewise mentions a wooden shovel which had undergone the same.

Thus, the alliance between peat, surturbrandt, coal, and jet, may be traced. In the first of these substances, the trunks, roots branches, bark, leaves, and seeds, of ligneous plants may be all distinctly seen, nay, every species of aquatic plants, of which it is partly composed, may be discovered in a distinct, entire organic form, where the smallest seeds and capillary tubes may be traced. In the second, only ligneous plants have been detected; yet all the parts of these in a partial or entire state of organization may be detected. In the third, the same discoveries have been made; nay, even in jet itself, there are specimens which exhibit distinct marks of organization as in coal; in neither of the two last mentioned have aquatic plants been often detected.

It is certain, that the softest and most porous peat, by mechanical pressure alone, may be converted into hard. Poiret takes notice of this; he says, that fibrous peat moss, though light and loose, may by this means be hardened to such a pitch, as to receive a polish like wood.

It is equally certain that peat, however soft and pulpy when dug, if ground and compressed in the manner in which the Dutch form their peat, acquires the density of, and becomes specifically heavier than, coal.

Some peat when dug, even without this mechanical pressure, becomes so hard, heavy, and so glossy in the fracture, that it is with difficulty it can be distinguished from some of the softer coals. On the contrary, Mr. Williams says, that he has seen coal so soft, that it was with difficulty it could be distinguished from the hard, black, glossy peat.

There are the strongest reasons for supposing, that all coal has been, at one period of its formation, in a soft pulpy state, like the above species of peat when newly dug—that coal, wherever it has been discovered, has certainly been exposed to a degree of mechanical pressure, far beyond that which ever was applied to peat by art. It would be superfluous to offer any proof of this; and if the best peat was subjected to the same degree of compression, it is obvious, that it would become equally compact and equally heavy, bulk for bulk, and equally as inflammable as coal; in no respect distinguishable from that substance, in colour, consistency, or chemical qualities.

Sir James Hall, whose experiments on this subject have so justly excited attention, says, "I have not made any experiments on peat with heat and compression; but I have little doubt that coal would be so produced, as well as from every animal and vegetable substance. I have always looked upon the peat of the old world, as one of the principal sources of our coal."

The chief difference that subsists between the hardest and most compact peat and coal seems to be, that the former contains more water and more acid than the latter. Bulk for bulk, they often contain nearly an equal proportion of bitumen; compression alone might remove this difference. It is not insinuated, that this is the case with every species of peat and coal; but that the former may be converted, by means of compression, into the latter, appears certain.

Most probably it is in this way, that all coal, strata, and surturbrandt, have been originally formed. A ruined forest or a mass of vegetable matter, such as is contained in moss, may have been overwhelmed by a current of lava, or overrun by a bed of sand, or argillaceous or calcarious matter, or buried in the caverns of the deep by the flood; in all of these cases, this matter must have been subjected to such a degree of compression, as is sufficient to consolidate it into a substance like coal or surturbrandt.

The external appearance of coal shews its alliance to peat, in colour and consistency; the resemblance is often clear.

It is however, a presumptive proof of the vegetable origin of peat, surturbrandt and coal, that all of them, by distillation, afford nearly the same elementary principles with vegetables, viz. air, water, an acid, an oil, salt, and earth ; and though the proportion of these ingredients may differ in these substances, and even in different species of each of them, yet the elements of which they are composed are not only the same, but are evolved in the same order.

There are many other circumstances which shew the alliance between peat and coal—suffice it only to name a few of these.

Both coal and peat are of a laminated texture—in the latter, these laminæ may be seen with the naked eye—in the former, they are frequently as conspicuous—in both, there are a few exceptions to this. Some peat and some coal are utterly destitute of this external appearance.

The more moisture accompanies both, the more they are inflammable.

The lowest strata in both are generally most inflammable, and most impregnated with bitumen ; to this there are very few exceptions in either. The surface of most species of peat is generally possessed of little bituminous matter, and of course, less inflammable than the substrata. The *out burst* of all coal is possessed of less inflammability than the rest of the seam.

Both are supposed by some to be renovated when dug : of the renovation of peat moss little doubt can be entertained—that of coal seems probable. Mr. Gannelo says, " he was an eye witness of the fact ;" he describes the manner in which coal is renovated in the Liege mines—" a bitumen impregnated with carbon transudes through the veins which form coal ; in forty years the wastes are filled up with it." He says he saw this new formed coal.

Moisture seems to be requisite for the renovation of both ; hence the common saying, that water is the mother of coal ; the same may be said of peat.

Both are stripped of their inflammability and tenacity, and other distinguishing qualities when long exposed to the air, and the alternations of heat and cold, moisture and drought. They both crumble down into powder and cease to be inflammable.

Some peats are highly bituminated, and emit much flame ; others burn with difficulty, and yield little or no flame. There

are also what is called blind coal, corresponding to the last, and cannel coal, yielding flame like the first.

As all the distinct species of peat graduate into each other by such insensible shades, that it is difficult, if not impossible, to draw a distinct line of separation between them, so the same is the case with all the varieties of coal.

These and many other circumstances, led Mr. Williams to make the following remark : "I have seen strata of coal that bore all imaginable marks of being composed of wood ; the colour, the quality, the stratification, the manner of burning, the ashes, and every thing else looked like peat."

There are in moss materials in abundance for the formation of bitumens ; the elementary principles of these substances are known. Hydrogen and carbon constitute the ingredients of all bituminous matter. Sometimes a portion of azote and oxygen enter into the combination The latter, by its action on the other ingredients, makes the whole assume a more concrete and solid consistency.

Hydrogen and carbon may be considered as the chief ingredients of all bitumens, whether solid, fluid, or æriform. That these abound in peat moss has been already shewn. But in order to the formation of bitumen, the carbon must be in a soluble state.

The carbon contained in the acids which exist in peat is already in a state of solution ; and if set free from its combination with oxygen, it is prepared to enter into combination with hydrogen, and form bituminous matter. That carbonic acid must have existed in all masses, at one period of their formation, cannot be doubted—that there is a perpetual accession of it, during the whole process, seems highly probable.

But not only is the carbon, which this acid contains, already in a soluble state, but all that which exists or existed in the gallic acid, while the vegetable matter was in a recent state, must be of the same description. As oils may be converted into resins, so may both be changed into bitumens. When transparent oil of turpentine, which resembles naptha in appearance, is mixed with a small portion of sulphuric acid, it is converted into a substance like petroleum. With a greater proportion of the acid it assumes the black tenacious appearance of Barbadoes tar, and the mixture may be so adjusted as to acquire the consistency of asphalt. In these cases, it is the accession of the oxygen in the acid that op-

erates this change. That such a change has taken place in the resins, gums, and oils, which exist in the vegetables of which moss and surturbrandt are composed, appears highly probable from this circumstance, that a resino-bituminous substance has been discovered in both.

That carbonaceous matter exists in a state of solution in the acids, and vegetable extract of moss is evident Till this carbon be set free from its combination with oxygen, and precipitated, it is not likely that it can enter into such a combination with hydrogen, so as to form bituminous matter.

The essential oils of vegetables must also undergo certain changes, before they can be converted into bituminous matter. It is probable, too. that before these changes be accomplished, these oils must become soluble in water.

The resins of the recent vegetable are still more insoluble than the oils ; yet it appears probable that they undergo solution before they are coverted into bitumen.

Even the acids, which exist in all moss, may operate to effect these changes. Mr. Hatchett shews, "that the acetic acid acts as a solvent of gums and resins, without altering their properties." Senebier found, "that the carbonic and gallic acids act in a similar manner."

Carbonated hydrogen gas may be considered as a species of bituminated matter ; it consists of the same elementary principles with the liquid and solid bitumens. The illustrious Dr. Black accordingly classed it among those substances, and he called it by its proper name, bitumen in a gaseous or aeriform state.

This aeriform bitumen, if prevented from flying off in a gaseous state, and collected in a refrigeratory, may be converted into a pure bituminous oil, like naptha.

Mr Hatchett says, "that bitumens owe their origin to the organized kingdoms of nature, and that there is almost unquestionable proofs that they are produced by the modification of some of the proximate principles of vegetables, especially of resins.

Upon the whole, we may conclude that "there is no occasion to ascribe the formation of moss merely to the deposition of matter by wind or water, or to crystallization, or to congelation, or refrigeration, or to exudation and subsequent concretion, or to an accumulation of animal matter, but to an accumulation of vegetable matter, by a process which is natural, and obvious, and easily accounted for, and to the various changes and combinations

which that matter has undergone in the medium of water in which it has been immersed; and that all the varieties of liquid, solid, and aeriform bitumen may be considered as allied to peat, and of the same origin."

The general conclusion, to which all these facts lead, is, that peat, surturbrandt, coal, and jet, are all homogeneous, and may all be traced to the same origin; and that they are all formed of vegetable matter, by one and the same process. Even in the softest peat, that process is begun—in the more compact species, it is advanced a step further—in surturbrandt, it is still nearer its completion—and in coal and jet, it is accomplished.

It is superfluous to offer any proof that inflammability is one of the distinguishing qualities of peat moss—this is acknowledged by all. Some species of peat, if once kindled, will burn for weeks or months with unabated fury. Dr. Anderson says, that the fire, drying the surface of the quick moss, penetrates deeper and deeper, till it sometimes goes six or eight feet deep before it stops.

Hydrogen exists in every vegetable, of which that substance is composed; it is one of the elementary principles of all the essential oils, gums and resins. Immersed deep in water or moss, where a low and equable temperature reigns, little or none of this hydrogen assumes the gaseous form, or is evolved in that state.

Peat, when newly dug, is soft, spongy, and pliable; yet after being exposed to the air and dried, it becomes a hard tenacious mass, insoluble in water: in this state it is somewhat elastic, and will bend before it breaks.

The more bitumen any peat contains, when newly dug, the more insoluble and impervious to water it becomes when thoroughly dried. Light, loose *flaw peat*, recently formed, imbibes water much more readily than the solid black peat—the former contains much less bituminous matter than the latter. And as all the bitumens repel water and are impervious to and insoluble in that liquid, is it not highly probable that they are the cause of these qualities in peat?

Though a piece of dried peat is thus impervious to water, yet when it is distilled, and by that means deprived of the whole, or the greatest part of the bitumen it contains, it becomes equally pervious as a similar mass of vegetables.

Another distinguishing quality of moss is, that no living animal exists in it.

There must, therefore, be some quality in the moss or moss waters, which is unfavourable for nourishing animal life, if not fatal to it.

Vegetable acids in moss are probably one cause why it is fatal to animal life. The carbonic acid which existed in the vegetable matter, or which has been formed in the first stages of fermentation, may be one cause; it is certainly deleterious to fishes. Mr. Hunter has shewn that they cannot exist many minutes in it.

The hydrogen too, contained in the vegetable matter of moss, may be another cause why it is deleterious to animals.

It would appear that the vegetable acids and hydrogen which abound in all mosses, and the mineral acids which exist in some, and the combinations formed by these substances, are sufficient to account for this distinguishing quality.

And if the same proportion of these existed in mould or any vegetable matter, it must on that account be equally deleterious.

Peat moss, in its natural state, is almost entirely barren; no grain of any kind can be reared on its soil, and few grasses fit for the use of cattle grow on it. Though entirely composed of vegetable matter, and though that matter, when it has undergone the putrid fermentation, forms the richest of all soils and an excellent manure, yet while it remains in the state of moss, and possesses all the distinguishing qualities of that substance, it is unfit for either of these important purposes.

The vegetable matter of which peat moss is composed cannot undergo the changes requisite to convert it into a fertile soil. Senebier justly observes, that whatever retards fermentation is equally unfavourable to germination and vegetation.

If peat moss, therefore, be vegetable matter arrested in the early stages of the fermentative process, and vegetable mould the same matter in which that process is accomplished, may not this be one reason why the latter is so fertile and the former so sterile?

Senebier has shewn by experiment, that no grain will germinate in pears and apples when they are nearly rotten; and it is known, that when certain trees are suffered to decay on the surface of the richest soil, the juices that exude from them render it sterile for a considerable time. Abbé Rosier observes, that wherever a peach tree is permitted to perish it vitiates the soil, and before another be planted in its place it is necessary

to renew the earth to the depth of three or four feet. It is equally certain, that the liquor taken from a tan pit or the juice of any tree which contains gallic acid and tannin is equally hostile to vegetation.

There are certain gases detected in moss, which may be another cause of its sterility.

Hydrogen, for the reasons assigned already, abounds more in moss than in vegetable mould. Though composed of the same materials, it is known that this gas is pernicious to living vegetables, at least in its simple state, or when it abounds too much.

Senebier has shewn by experiment that no grain will germinate in it.

Peat moss is destitute of that mixture of different earths, which enter into the composition of other soils. Most fertile soils contain a proportion of the following earth, besides vegetable matter; silicious, argillaceous, and calcarious earth. For the most part, few of the peat mosses contain such a mixture.

That the mechanical structure of peat in its natural state is hostile to vegetation, cannot be denied; and till this be removed it will remain sterile. That it becomes often too light, loose, and porous, after being reclaimed, and by this means too wet at one time and too dry at another, as a soil, is equally certain.

From the foregoing view of the subject, we may conclude that the following causes may be assigned for this quality.

First, That the vegetable matter, of which peat moss is composed, has been secluded from the atmosphere.

Secondly, That on this account that matter has been arrested in the early stages of the fermentative process.

Thirdly, That the vegetable acids and extractive matter that abound in it are hostile to vegetation.

Fourthly, That the various gases with which it is impregnated are equally unfavourable.

Fifthly, That the bituminous oil it contains may occasion sterility.

Sixthly, That the mineral acids, and seventhly, the salts they form in some mosses, are the chief causes of this quality.

That all peat moss is more inflammable, more antiseptic, more tenacious, and contains more acidity than vegetable mould, though originally composed of the same materials, is true; that it is also more deleterious to living animals, and much more

sterile as a soil than that matter. But all the varieties of bitumens, whether solid, liquid, or aeriform, are possessed of the same qualities—all are inflammable—all operate as antiseptics—all are of similar colour—all are tenacious—all are hostile to animal life, and all of them occasion sterility; even in this view of the subject, therefore, the alliance between peat moss and bituminous matter may still be traced. This consideration corroborates the conclusion, that they are homogeneous in their origin.

Though all peat moss be of vegetable origin, yet the situations in which it is formed, the plants of which it is composed, and the state in which it is found being different, it is reasonable to expect that one moss should differ from another in its appearance, qualities, and the uses to which it may be made subservient. This difference may be often detected by the naked eye, whether the moss be in the pit, or dug and dried, or burning, or reduced to ashes.

The various colours that substance assumes, and the external appearance of it, mark the difference. Some are of a bright yellow colour, others brown, or jet black; some are composed of a congeries of vegetables in an organized state; in others, few or no traces of organization can be seen. Clay, sand, and shells, may be detected in some; in others, no such mixture can be discovered. Some are soft and greasy, like butter, and form a hard, brittle, tenacious peat, almost like coal; others are loose and friable like mould. The water squeezed out of one moss is of the colour of amber; of another, of claret or port wine; and of a third as black as ink. In some cases this water effervesces with chalk, in others not. Sometimes it leaves a copious sediment by evaporation which is highly inflammable; in other cases the sediment is small and scarcely inflammable. Some are covered with a rich luxuriance of aquatic plants, others are utterly bare, barren, and destitute of vegetables on their surface.

Poiret has made a distinction of this substance into two kinds; he calls the one fibrous, the other compact. As this distinction seems to be well founded, it may be proper to state it fully, and to attempt a description of both these varieties.

Fibrous moss is composed of the roots, stems, and branches of marshy plants; of course, the moss is a loose, light, porous, elastic substance, retaining the plants of which it is composed, in their original organized state.

The characters of this genus are sufficiently marked and may be easily distinguished.

When lying in its natural state it is always a soft, porous, spongy, and very elastic substance, composed of a variety of plants in an organized state. The roots, stems, branches, and leaves, and often the seeds of every species of plant of which it is composed, may be distinctly seen. It is frequently so tough and elastic, that the finest edge tool or spade can scarcely cut it. The water squeezed out of it generally effervesces with chalk, and when evaporated leaves little sediment.

When dug and dried it is a light coloured, porous substance; sometimes that colour is a dirty white, or bright yellow; seldom is it brown and never black. This genus is always specifically lighter than water, and it may be torn asunder easily; but it is so elastic when dry, that though it yields to compression for a time, it soon reverts to its former shape and size. When immersed in water, it absorbs that liquid readily, and becomes like a wet sponge. When burning it emits a light coloured smoke, little flame, and little heat—it does not last long and leaves a great deal of ashes.

These ashes are generally of a whitish grey colour; they seldom become red when exposed to the air. They are very light, contain few salts, and are scarcely attracted by the magnet.

M. Poiret describes another genus, which he calls compact moss; his description of it is sufficiently distinct. He says, "it is not found in shallow marshes, but in the bottom of canals and deep pools; it is not composed of similar plants with the former, but chiefly aquatics; these plants being mostly of a tender and pulpy texture, having neither coriaceous nor ligneous fibre, are more speedily decomposed than marshy plants; by this means they form a thick black pulp, which sinks to the bottom of the lake or pool. The moss which is thereby formed he calls compact, because, though soft and slimy when dug, yet by compression or when dried, it is at last converted into a solid, compact substance, which contains few, and sometimes no vegetables in their original organized form.

In its natural state, it is less elastic and much more compact and darker in colour than fibrous moss. It is more easily cut with an edge tool, and it contains few vegetables in a state of organization. It feels soft and pulpy to the touch; and the water squeezed out of it is of a deeper dye, and yields a more copious and inflammable sediment by evaporation.

When dug and dried, it is of a brownish black colour ; and though soft at first, it soon becomes a solid, hard, tenacious substance, much more compact, much heavier and less elastic than fibrous peat. Though immersed in water, it will not absorb that liquid.

When burning it emits a darker smoke and brighter flame ; it lasts much longer in the fire, and yields a more intense heat and more ashes.

Whether moss be intended for a soil or a manure, the above distinction may be of use ; for it is obvious that these two genera must require very different treatment, in order to reduce them to either of these economical purposes.

It is a distinction, too, which has this obvious advantage, that the practical farmer can be at no loss to discriminate these two kinds. The difference that exists between them is so palpable as to be obvious at first sight.

If the above distinction be correct, we are at no loss to know of what materials each of the above genera is composed. The fibrous peat consists of a congeries of vegetable matter mostly in an organized state. The carbon contained in the fibres of these vegetables, has never yet been wholly dissolved ; less soluble carbon therefore enters into the combination of this, than of compact peat—the former may therefore be expected to contain less bituminous matter, and on this account it must be less inflammable. But even in fibrous peat, a part of the carbon, especially that which is contained in the acids, oils, gums, and tannin, may have become soluble. By combining with the hydrogen of these vegetables, it must form an inflammable bituminous substance. The most fibrous peat on this account must be inflammable, and contain a small portion of oleaginous matter ; and it is reasonable to suppose that by continual maceration, and the operation of those chemical agents which are found in moss, the whole fibrous structure of the vegetable may be ultimately destroyed, and the whole carbon it contains rendered soluble. By this means, the fibrous may at last be converted into compact moss.

This last therefore consists of the same elementary principles with the first ; the chief difference between them is, that these elementary principles have all been separated and combined anew in compact peat, thereby forming a greater proportion of resinous, bituminous matter, such as has been detected in moss, surturbrandt, and the substance which accompanies it ; whereas

only a part of these principles have been set free from their combinations in fibrous peat.

Highly bituminated peat is indeed a compact moss, and generally contains few or no vegetables in an organized state. It differs chiefly, if not solely, from the above genus, by the greater quantity of bituminous oil it contains; yet this one ingredient imprints on it such distinct characters that it is easy to discriminate the difference that exists between them. Bituminous is always black, like compact moss; but the former, when newly dug, feels softer and more greasy to the touch; it is, too, much more unfavourable to vegetation—no plant nor shrub will vegetate in it. The water squeezed out of it is of a darker colour, resembling that of tar melted; and when evaporated, it leaves a much greater sediment, and more inflammable.

When dried into peat, it becomes not only black, but glossy; it is of a resinous lustre in the fracture; when held in the hand it emits a fetid bituminous odour; and it is so ponderous, that it sinks in water.

When burning, it emits a bright white flame, like tallow or butter; it will even burn like cannel coal, when carried in the hand. When kindled, it is difficult to extinguish it—the smoke it yields is black and very dense—it leaves few ashes when burnt. If sulphuric acid be poured on it, the effervescence is so strong that it kindles into a flame, and discharges, by this means, as well as by distillation, a vast quantity of hydrogen, and carbonated hydrogen. The proportion of oil obtained from it, in the last process, is sometimes equal to one fifth or one third of its weight.

It is of much importance to consider this as constituting a distinct genus of moss; both because it is extremely unfavourble for cultivation as a soil, and because it is of much more value than any soil, for other economical purposes.

The consistency, colour, and chemical qualities of moss as a soil. sometimes depend on the mixture of other earths, and wherever this mixture takes place, such mosses ought to be classed under a distinct name, as they are possessed of different qualities from fibrous, compact, bituminous, or even calcarious moss.

Such as are mixed with a considerable proportion of clay and sand are of this description. Though in the eye of the chemist and natural historian, they cannot so well be considered as constituting a distinct genus, yet they unquestionably claim this dis-

tinction, when considered as a soil capable of improvement; for they require a different treatment from fibrous, compact, bituminous, or calcareous moss; and when improved, they constitute a different kind of soil. This distinction is of equal necessity, when moss is considered as capable of being converted into a manure for other soils; for this genus requires to be prepared in a manner totally different from any of the other genera, and the manure it yields is possessed of different qualities, and adapted to different soils.

The appropriate technical name of all moss is geanthrax, or coal of earth. Peat moss corresponds to this—properly speaking, the name peat ought only to be applied to dried moss—the single word moss ought to be applied to a piece of wet newly dug peat.

Some mosses contain in themselves, the best materials and the best manure for their improvement—they stand in no need of adventitious aid. Others are so absolutely sterile, that the expense of reclaiming them as a soil would surpass their value. To some, lime may be applied with great effect, others stand in need of no such manure; some may be pared and burnt to vast advantage, others would be utterly and for years, if not for ever, ruined as a soil by this practice—in some mosses, dung will operate immediately and long—applied to others, it will be of little or no use.

Some may serve as a soil, manure, or fuel. It is from want of due attention, and from the misapplication of manure and money, in cultivating different kinds of moss, by one and the same means, that so many have failed of success: hence the common cry against every attempt of this kind—hence the sarcasms and sneers of the vulgar—and hence, if the application of lime succeed in one moss, all adopt the same mode of culture, as if lime alone could succeed. And if dung succeed in another case, lime is condemned, and dung extolled as the only manure for every moss. Such failures, and such misapplication of labour, money, and manure, have done essential injury to the interests of agriculture. Every new case of this kind raises and redoubles the clamour; and the richer the proprietor, and the more he spends or throws away in the experiment, the louder the cry, and the stronger the prejudices of the public against such attempts become. Whereas, if we would follow nature, and mark her slow, silent and powerful hand, perpetually at work, and lend the feeble aid of art to her operations, success would be certain in every attempt.

In this essay some technical terms have unavoidably been used. As they may be unintelligible to some readers, the following vocabulary may be consulted.

Vocabulary.

1. *Oxygen* is one of the ingredients of the atmosphere, and a constituent principle of the acids, and many natural compounds. It has been called *vital* air, as it is absolutely requsite for the life of animals.

2. *Azote* is another ingredient of atmospheric air. The air consists of nearly seven parts of azote to two of oxygen. The former is as fatal to life, when alone, (hence its name) as the latter is favourable. But when both are combined in the proportion above named, they constitute the air we breathe.

3. *Hydrogen* as its name imports, is the basis of water. It is specifically much lighter than atmospheric air, and highly inflammable. Hence it was called inflammable air by the ancients. When it combines with oxygen it forms water; hence its name.

4. *Carbon* is the name given to the pure inflammable base of charcoal. It is seldom found pure. Generally it is combined with a little hydrogen and oxygen, and other foreign ingredients, derived from the substances from which charcoal is prepared.

5. *Carbonic acid* is a compound of carbon with oxygen. When pure, it exists in the form of gas. It was called fixed air by the old chemists, and is fatal to life when breathed.

6. *Phosphorus* is a substance highly inflammable. It exists in, and forms a constituent part of animal matter, and of several vegetables.

7. *Gallic acid* is found chiefly in those vegetables which have an astringent property; and it was once regarded as the principle of astringency. The quality, however, seems to arise more particularly from another vegetable principle, called *tanin*, as it operates chiefly in tanning leather. These two, the gallic acid and tanin, are often found to accompany each other.

8. *Pyrites* is a combination of metals with sulphur. With iron, sulphur forms iron pyrites. With copper, it forms copper pyrites. When exposed to moisture and air, they take fire. Hence the name *pyrites*, or, as it has been called, *fire-stone*.

9. *Sulphats* is the name applied to all the salts formed by the sulphuric acid. When iron is the base, it is called sulphat of

iron. So when copper, or potass, or ammonia form the base, it is called sulphat of copper, of potass, or of ammonia.

10. *Carbonates*, *muriats*, &c. are salts formed of the same bases, with carbonic, or muriatic acid.

11. *Surturbrandt* is a species of coal, which contains and seems chiefly to be composed of ligneous plants or trees, nearly in their original organic form.

12. *Bovey coal* is similar to surturbrandt.

HORN DISTEMPER IN CATTLE.

[Communicated by the President of the Society.]

In reading a Journal of Military Surgery lately published in France, by D. J. Larrey, M. D. first surgeon of the imperial guards, and inspector general of the medical staff of the French armies in Egypt, Italy, and Germany, I found an account written by him, of a contagious disease among the cattle in Italy, particularly in Venitian Frioul, in 1793, which almost destroyed the cattle in that quarter. He says, "the disease was at its acme when I arrived at Udino. It assumed all the characters of an inflammatory malignant fever. It commenced by a general heat, dryness of the nostrils, bristling of the hair, hardness of the skin and obstinate costiveness. The sick animal drooped its head—appeared agitated—the eyes became red and haggard. This fever proceeded from the commencement of the symptoms with more or less rapidity, according to the age of the animal or its irritability. After this first stage the abdomen became inflated ; the hair dry and stiff ; the strength failed ; the ears became withered and pendant. Cutaneous perspiration ceased—respiration difficult—the animal tottered, and if it fell had not power to rise. Malignant tumors sometimes appeared on cows near the udder. I caused many of these animals to be opened and examined in my presence, and generally found the stomach filled with undigested herbs ; the mucous membrane of the stomach and intestines inflamed and gangrened in many places, and the epiploons decayed. At the third stage the disease was highly contagious. All the cattle in the same enclosure with the infected animal took it and died. All other domestic animals took

the disease, particularly sheep. The dogs, cats, and even fowls were infected with it.

"The inhabitants of the places where it was most violent were subjected to its malignant influence. I first ordered the animal to be interred without taking off his skin. I then detailed the manner of treatment in the following terms. If the animal be robust at the commencement of the disease, he should be bled as soon as there are any appearances of inflammation, or the gums and pallate scarified, which is generally sufficient. Costiveness being one of the first symptoms of this disease, the rectum must be opened, which is best done with stimulating glysters. The hand would answer, but there is danger of taking the disease. Cooling drinks should be given, and the body sprinkled with warm vinegar and water, and covered with a woollen cloth. After employing these means, the horns of the animal should be bored in several places near the base. The instrument should be inserted deep enough to penetrate the cellular cavity, from which will issue the fluid that obstructs the frontal sinus. This operation has an influence on the brain and revives the animal. I ordered a hot iron to be passed through the thicker part of the dewlap, and inserted a roll of linen thread covered with basilicon, and, to promote irritation as the thread was moved, to have it sprinkled with powdered cantharides. If the animal is not materially altered for the better before the ninth day, I recommend killing him and burying him instantly to prevent contagion. As soon as the symptoms give way, light food, such as gruels from flour or barley meal, is the best.

"By following my prescriptions, in a few weeks the contagion and disease ceased completely, and I received the thanks of all the people and magistrates of that unhappy country. The preliminaries of peace having been agreed on with Austria, I was travelling to Trieste with my friend, General Desaix, through the Venetian territories."

AARON DEXTER.

The disease described by the French surgeon appears to be the same, or nearly allied to what is called the *horn distemper* in this country.

Within a few years I have had two cases among my cattle. The first case I had ever seen was of a cow kept in my stable

in this town. The animal lost her appetite and milk suddenly, and was in a general tremor when I was first informed of any difficulty. A man from the country came into my barn, and on seeing the cow he pronounced her disorder to be the horn distemper, and that her horns were cold, but that he could cure her if I would permit him to pursue his own remedy. On obtaining my consent, he immediately bored a hole through each horn, within four inches of their base. He found them entirely hollow, a small quantity of bloody matter was discharged from the holes. He then gave her some medicine which I had prepared of senna and salts, which soon operated; after this he gave her gruel, seasoned with pepper, by means of a common glass bottle. In a few days the animal was well.

The second case was of a young ox at Chelsea the last June. I was informed by my farmer that one of my oxen was sick and would die. I went immediately to see him. The animal had been drooping several days and was unwilling to move; he would neither eat nor drink; and on the day I was informed of his sickness, after tottering some time he fell and lay stretched on the ground, in which position I found him; he seemed lifeless, except at intervals, when he made a moaning noise. His nostrils were dry, and his eyes sunk in their sockets. He appeared to have had no evacuations, but was very little swelled. His horns were bored through, within four inches of their base, from whence issued a small quantity of feted matter; they were hollow. He appeared insensible to the operation of boring. I poured into his horns some hot spirit mixed with pepper, which gave him some uneasiness and was soon followed by a discharge of mucous from the nose. A glyster of warm salt and water was given him. I directed some gruel of Indian meal, well seasoned with pepper, to be put into his stomach by the aid of a bottle, which operations were repeated several times in the course of the day. The next morning I saw him and found him better; the same applications were continued. On the fourth day, the animal raised himself with assistance on his feet and began to feed on the tender grass. He soon recovered, but was reduced almost to a skeleton. I believe the first symptoms of this disease, are loss of appetite and cold horns; with these appearances I should advise that the horns be immediately bored quite through with a nail gimblet, in preference to cutting them off as is frequently practised. A small stick or wire should be

passed through the horns every day to keep the hole from closing with gelatinous matter. If the disease does not change favourably the second day after boring the horns, I would advise that a sharp instrument be passed through the dewlap, and a roll of linen thread drawn through it, covered with turpentine, or basilicon if equally convenient, and when moved, as it should be every day, the thread should be sprinkled with powdered cantharides. This is Dr Larrey's recommendation. I do not believe that any advantage is derived from having the perforating instrument heated, as it only tends to cauterize the parts and render the wound insensible to other stimulants.

With respect,

AARON DEXTER.

To the Trustees of the Massachusetts Society for Promoting Agriculture.

BOSTON, May 9th, 1815.

REMARKS ON THE CANKER WORM.

[To the Recording Secretary of the Massachusetts Society for Promoting Agriculture.]

Roxbury, May 22, 1815.

SIR,

AFTER having been freed for nearly twenty years from the ravages of the canker worm, by a providential frost on the 17th of May, 1794, our orchards are again overrun with them, and some of the most valuable trees of our country are threatened with destruction. It is true this evil can be prevented by another which, if we are not soon aided by a timely frost, may be deemed almost as great an one. The expense of tarring an orchard for several years, together with the injury sustained by the trees in the common mode of doing it, will be nearly equivalent to a total loss.

The improvements introduced by Mr. Parsons and other cultivators, of surrounding the trees with canvass and rope yarn, and stopping the descent of the tar by a bandage of coarse hemp together with the mixture of the tar with oil, so as to keep it longer in a soft state, have very much diminished the inconveniences of the old practice.

Still much remains to be desired. The process is imperfect, unless performed as faithfully in the fall as in the spring. If your neighbours are inattentive you may be subjected to this labour for ten or twenty years, and your orchards will scarcely pay the continued and accumulating expense.

Something further seems to be desirable, some mode more simple, less expensive, more effectual.

In the southern states, I perceive some persons are still ignorant of the natural history of this insect, and regret that it has not been examined and described by scientific men. We have nothing left to desire on this head. The description of the canker worm by Professor Peck is very satisfactory, and only leaves us to regret, that the same ingenuity could not have devised some speedy and simple mode of extirpating, or checking them.

Until some effectual mode is discovered, I think we should make constant experiments, and communicate fully the results, in the hope that if our trials shall not prove in every case successful, they may stimulate others to more happy ones.

I had understood that Mr. Josiah Knapp, of Boston, was induced to try the effect of air slacked lime. He put it round one of his trees in the spring of 1814, and I have been assured not only by him, but by another respectable friend who examined it, that it was fully successful. The tree was in a small garden, in Boston, surrounded with other trees which were filled with the worms, and this one wholly escaped, except that a few appeared to have attacked its extremities, where they were interlocked with the other trees.

I mentioned this fact to a Rhode Island gentleman, who informed me, that in that State they had used the rubbish collected from the breaking of flax, and it had effectually prevented the rise of the insect.

I resolved to make the experiment of lime on an extensive scale. As the insects rise in the fall, I determined to put the lime on in the autumn.

For this purpose I had the turf dug in around sixty apple trees, and the earth laid smooth. I then took three hogsheads of *effete* or air slacked lime, and strewed it an inch thick round my trees, to the extent of about two or three feet from the roots, so that the whole diameter of the opening was from four to six feet.

I tarred these tress as well as the others, and although I had worms or grubs on most that were not limed, I did not catch a single grub where the trees were limed.

I do not mean to speak with confidence. I am however strongly encouraged to believe the remedy perfect. It was ascertained by Professor Peck, that the insect seldom descended into the ground at a greater distance than three or four feet from the trunk, and to the depth of four inches, or that the greater part come within that distance. The lime is known to be destructive of all animal substances, and I have little doubt that it actually decomposes and destroys the insect in the chrysalis state, at least, I hope this is the case.

There are many reasons which should encourage the repetition of this experiment. The digging round the trees is highly useful to them, while tarring is very injurious. The expense is not great. A man can dig round fifty large trees in one day. The lime is a most salutary manure to the trees. After the spot has been once opened and limed, the labour of keeping it open will not be great. Three hoghsheads of air slacked lime, or sweepings of a lime store, will suffice for fifty trees, and will cost three dollars. As it is done but once a year, I think it cannot be half so expensive as tarring.

I repeat it, sir, that I mention my experiments with great diffidence, as being the first of my own knowledge. It may induce several persons to try it in different places, and where trees are surrounded with others which are treated differently. All I pray is, that it may prove to be successful and relieve us from this dreadful scourge which defaces our country, while it impoverishes and disappoints the farmer. If it should succeed, Mr Knapp will merit the thanks of the public for his ingenious experiment.

J. LOWELL.

ON THE RELATIVE ADVANTAGES OF FEEDING CATTLE IN THE STABLE OR FARM YARD, OR SENDING THEM TO PASTURES.

This is one of the questions which have been much discussed in Europe of late years. Perhaps it is one, which can only arise in countries which have arrived at a pretty high degree of im-

provement in agriculture. Perhaps it can only be of interest where the population bears a greater proportion to the land which supports it than it does in New England.

While our farms are so extensive, and while our cultivators continue poor and unable to till the whole of their lands, perhaps it may be more profitable to continue to let our cattle roam over uncultivated fields, gathering a scanty subsistence, or fattening themselves on extensive tracts, which the farmer can neither beneficially cultivate nor advantageously sell.

But since the state of Massachusetts, to which our labours are chiefly confined, and our views in the first instance directed, has in many parts arrived to a higher degree of improvement; since near the great towns, and in the counties of Essex, Hampshire, and Worcester, lands have appreciated in value, and farms have become more divided, it may not be too early to begin the discussion of this question, which has been received and discussed with so much interest in Europe.

It is now almost received as established truth in England, that it is more profitable to feed cattle in the barn yard from green fodder cut for them, than to permit them to roam over and tread down, and destroy the grass of many acres, in which the very abundance creates satiety and disgust to the herd which feed upon them.

In France the doctrine was received more recently, but not with less favor, by the intelligent cultivators, and it would seem that Europe owes to the Swiss, who are very economical farmers, the introduction of the practice.

For the amusement and instruction of your readers, I shall make an abstract of some remarks of the Abbe Rosier on this subject.

One of the Trustees of the Massachusetts Agricultural Society.

Roxbury, May 22d, 1815.

"We owe to Monsieur Ischeffeli, of Berne, a train of remarks and experiments on this subject, as judicious as they are important, which have begun to produce a revolution on this subject in Switzerland, where they raise a prodigious number of cattle. May the example he has afforded be imitated in France!

"The immediate and direct profit of horned cattle consists—1st, In their multiplication 2d, In their sale when fatted. 3d, In their milk. 4th, In their labour.

"All these advantages depend on the health of the cattle, and this health is the result—1st, Of well chosen, sufficient and regulated nourishment. 2d, Of the care taken of the animal. 3d, Of the repose you allow to them. 4th, Of the salubrity or goodness of the water they drink. 5th, Of the temperature of the air to which they are exposed.

"Many of our farmers have too many cattle for their winter supply of provender. They are obliged to turn them out early. These hungry animals find the pastures almost destitute of proper food. Rain, frost, winds, to which they are exposed, often occasion serious diseases among them or check their growth. Even the summer itself brings with it afflictions to cattle which are in pasture. They are attacked by flies and a thousand other insects which harass them. Often exhausted and thirsty, they run to quench their thirst into some stagnant and unhealthy pool, which is the occasion of many serious maladies.

"In autumn they are not exempt from evils. The weather is often wet and cold, and the beasts are exposed to changes and vicissitudes which are pernicious to them

"The promiscuous connection of cattle in large pastures is also injurious, as it tends to degrade and injure the breed.

"Young cattle are suffered to run with the old, and heifers of one or two years old are often impregnated, by which means they are stinted in their growth, and produce a feeble and degenerate race.

"To this system of Monsieur Ischeffeli, of feeding the cattle in the yard, objections of various kinds have been made.

"First. It is said that the health of the cattle requires that they should be put into pastures where they may roam freely, because it is the natural condition of such animals. We agree that in mild climates, of which these animals were probably natives, this would be true; such for example, as Mexico and part of South America; but whatever may have been the cause, whether the manner in which we have treated them, or any other cause, it is a fact that they are now so tender, that even in the mild climate of France they require shelter in winter, and being so sheltered, they require even in spring and autumn some protection against the inclemencies of the weather. It is also true,

that epidemic diseases have most usually taken their rise among cattle which have been pastured in large droves, and they certainly are more easily communicated there.

"In the famous epidemic which destroyed nearly all the cattle of Languedock, and of the west of France, in 1775, 1776, and 1777, when the disease was so dreadful, that its propagation was stopped only by a cordon or line of troops, it is well known, that a single ox from Hungary brought the disease into Italy, and destroyed the cattle of that country, and that both there and in France, those who kept their cattle shut up in their stables or barns escaped the calamity.

"The second objection to feeding cattle in the yard is, that it absorbs all the profit. This is an idle and unfounded objection. If the animals eat more in the yard, if they enjoy better health, if the cows give more milk, what can we answer? This is what we shall prove. The great benefit of the mode we recommend is the increase of manure. This is the great support of every farm, and the most important object of every cultivator.

"It is well known, that in Switzerland they esteem four acres but a moderate quantity of pasturage for one good cow, from the 10th of May to the 15th of October. This quantity of land would much more than suffice if the fodder was cut green and carried to the animal. It is incredible what a quantity of food is trodden down and destroyed by cattle in pastures, into which they are turned. Those who have tried this mode in France of feeding cattle on green fodder cut for them have found, that four cows may be fed on the grass of an equal sized piece of poor land, when a like quantity of excellent land would not keep three in the common mode of pasturing. The difference between the consumption of a cow of green fodder and of hay is amazing. It is well ascertained, that a cow will consume one hundred and fifty weight of grass, say clover, per day, whereas in winter she will only eat twenty-five pounds of hay per day. This difference of consumption you perceive in the increased quantity of manure; and it is also well ascertained, that the quality of the manure is much better from the animals in summer, than in winter.

"It is also still more true as to the food. The most subtle and nutritious particles escape in drying the grass. Hence the exquisite flavour exhaled by grass in the process of making the hay, all which is lost to the animal.

"It is a well attested and indisputable fact, that cattle fatted for the market are sooner and better fatted, cows give much more milk, and young cattle thrive much more when fed in the stable from green fodder, than when pastured.

"We should conclude from our observations, that every intelligent farmer who understands his interest will make no more hay than is necessary for winter, but that he will feed his cattle from his mowing lands daily with fresh cut grass. Thus he will accumulate much more manure, his cattle will be better fed and at less expense of food."—ABBE ROSIER.

SERIES OF EXPERIMENTS TO ASCERTAIN THE QUANTITY OF SEED NECESSARY TO PRODUCE THE BEST CROP OF POTATOES.

[To the Corresponding Secretary.]

SIR, *Dover, N. H. April 8th*, 1815.

IN a climate so far north as ours, especially New Hampshire and the District of Maine, where our crops of Indian corn are liable to be cut off, or much injured by vernal and autumnal frosts, and when on this crop it is that the great mass of the population depend for their bread. it becomes a desideratum to cultivate in plenty some vegetable which is more certain in its produce, and at the same time the best substitute for Indian corn.

The potatoe being of easy cultivation, generally abundant in its produce, and of quick growth—ripening in three or four months—and being allowed by all to be the best substitute for bread—its cultivation should therefore attract the serious attention of farmers.

Should there be a very abundant crop and no market for them, they will richly repay the farmer his expense and trouble in raising, for the purpose of feeding his sheep, swine, and cattle.

The cold, wet summer of 1812, and severe frosts, destroyed in a great measure the Indian corn in this section of the country; and, in the interior, many, who in common seasons had produce to spare for the market, suffered severely for want of provisions, both vegetable and animal; the scarcity of the one producing in

a degree that of the other. Had large crops of potatoes been raised, this evil would have been obviated in a great measure.

So wide a difference of opinion exists amongst both scientific and merely practical farmers, as to the quantity of seed necessary to produce the best crop of potatoes, I had determined to make an experiment on this subject. For this purpose I selected a piece of sandy loam incumbent on a substratum of sand, the whole ground as near alike, as to quality, as possible; and now enclose you the result of forty experiments.

Should you think the enclosed paper worthy the notice of your very valuable and respectable Society, or of publication, please to dispose of it as you think proper, but without my name.

These experiments were made under my immediate inspection, therefore I can answer for their correctness.

I am, Sir, &c.

Result of fifteen Experiments, made at Dover, (N. H.) A. D. 1813, of seeding Potatoes, consisting of 20 hills—the rows 3 feet apart, hills 2 feet, without any manure, *on sandy loam that had been two years planted.*

Number of experiments.	*Quantity of seed.*	*Description of the seed as put into the ground.*	*Weight of seed in 20 hills.*		*Total produce.*
	oz.		*lbs*	*oz*	
No. 1	12	Two whole potatoes, - - -	15		80
2	6	One do. - - - - - -	7	8	48
3	12	Two do. cut in halves, latitudinally,	15		61
4	6	One do. do. do.	7	8	55
5	2	The eyes of 2 potatoes, which weighed 12oz.	3	4	28
6	1	The eyes of 1 do. do.	1	10	20
7	6	One potatoe cut in quarters, longitudinally,	7	8	56
8	3	Half do. do. do.	3	12	35
9	3	Half do. cut in halves, do.	3	12	37
10	1½	One quarter of a potatoe, - -	1	14	32
11	4	Four potatoes, whole, wt. 1oz. each, produce small size,	5		39
12	2	Two do. do. do. rather small,	2	8	35
13	1	One do. do. do. good size,	1	4	31
14	4	The sprout end of 2 potatoes, ⅓ of each,	5		42
15	6	One potatoe, weight 6oz. eyes cut out,	7	8	33
			88	0	632
		Gain by manuring, - -			143
				lbs.	775

The following fifteen Experiments are exactly the same as the former, with the addition only of a shovel full of good barn manure to each hill.

Number of experiments	Quantity of seed. oz.	Description of the seed as put into the ground.	wt. of seed in 20 hills lbs	oz.	Total produce.
No. 1	12	Two whole potatoes, - - -	15		76
2	6	One do. - - - - -	7	8	46
3	12	Two do. cut in halves, latitudinally,	15		73
4	6	One do. do. do.	7	8	64
5	2	The eyes of 2 potatoes, which weighed 12oz.	3	4	44
6	1	The eyes of 1 do. do.	1	10	46
7	6	One potatoe cut in quarters, longitudinally,	7	8	65
8	3	Half do. do. do.	3	12	48
9	3	Half do. cut in halves, do.	3	12	54
10	1½	One quarter of a potatoe, - - -	1	14	38
11	4	Four potatoes, wt. 1oz. each, the produce small size,	5		52
12	2	Two do. do. rather small,	2	8	44
13	1	One do. do. good size,	1	4	37
14	4	The sprout end of 2 potatoes, ⅓ of each,	5		46
15	6	One potatoe, the eyes cut out, - -	7	8	42
			88	0	775

*Result of ten experiments of seeding Potatoes, 20 hills each, manured with a small hand-full of *Rock-weed.*

Number of experiments.	Quantity of seed. oz	Description of the seed as put into the ground.	wt. of seed in 20 hills. lbs	oz.	Total produce.
No. 1	12	Two whole potatoes, - - -	15		73
2	6	One do. - - - -	7	8	61
3	6	One do. quartered longitudinally,	7	8	67
4	3	One half potatoe, divided do.	3	12	52
5	1½	One quarter of the potatoe, - -	1	14	26
6	8	Four whole potatoes, 2 oz. each, - -	10		69
7	6	Three do. do. - -	7	8	44
8	4	Two do. do. - - -	5		53
9	2	One do. do. - -	2	8	42
10	2	One do. cut in halves, - -	2	8	47
			63	2	534

* Fucus of Lin. much used as a manure for raising corn on sandy plains in this vicinity.

The foregoing experiments prove, what all experienced farmers were convinced of, that poor land requires more seed in all kinds of crops, than that under a high state of cultivation.

N. B. A bushel of potatoes weighs 56 to 58 lbs.

The potatoe used for seed in the above described experiments was the large blue.

DISORDER AMONG SHEEP.

[From the Herald of Liberty.—Kennebec County.]

THERE is a disorder prevailing among sheep, which is, I believe, little known, yet very destructive. My object in communicating the facts, of which I am by accident in possession, is to induce some gentleman, who is learned on the subject, to show the cause and point out the remedy.

In the month of December a number of my three quarters blooded Merino bucks were taken with scouring. I immediately used such remedies, as appeared to me to be indicated ; among which was a strong decoction of white pine bark, of white oak bark, and many other things, not important to be mentioned. The disorder baffled all my exertions, and they died in the course of five or six weeks. A number of my half blooded wethers were also seized with the same distemper. Instead of giving them astringents, I gave them salts and castor oil ; but without any benefit. I continued to try experiments upon them for a long time without success, and therefore concluded that the disease was incurable, and made no further exertions, not suspecting the real cause of their death, of which I should forever have remained ignorant, had not an accident revealed it to me. As I was moving one of them by the horn while alive, the horn came off, and to my astonishment it was almost full of worms of a brownish colour, with five or six black stripes across the back. Many of them were near an inch in length, and more than a third of an inch in diameter. On examining the head I found some large and some small ones. The smallest were not larger than a cheese-maggot and as white as chalk, while others were as large as before described. I afterwards examined those that had previously died, and found the same kind of worms in their heads. As all that had died were males, they all had horns, the pith of which

was almost entirely devoured, as well as much substance in the forehead. I desired a number of my neighbors to examine their sheep, which had died, (some by scouring and some otherwise) they accordingly did and found worms in the head I believe there were more than a hundred worms in the head which was eaten as hollow as a pumpkin. I tried only two experiments upon them after I found the cause of death. I cut off the wool from the forehead of one wether, and washed the skin with the Spirits of Turpentine, in which I also wet a cloth and bound it upon his head. I repeated the application a number of times, and I found it made it worse. I caused it to be killed in order to know whether the worms were dead, but I found they were all alive. I then tried another experiment on an ewe. I took my tobacco pipe, with which I smoke my sheep, and put the tube into one nostril, and blowed up tobacco-smoke into the head with so much force, that it came out at the other nostril, and brought out one dead worm. The experiment was repeated a number of times; but the effect on the sheep was more powerful than on the worms. When it was acertained that the sheep must soon die, it was thought best to kill it, in order, as in the other case, to see the state of the worms, (as they live but a short time after the death of the sheep) and they were as lively as if nothing had been done. All which I have lost, had worms, but all have not scoured. Those which have died this spring were not seized with scouring. They had no visible disorder upon them. One not acquainted would suppose they died for want of food. The symptoms, other than scouring, are dulness of eyes—partial loss of appetite—shaking of the head—when they lie down they rest their head on the ground Some live a number of months after they begin to pine; and I have even known some to live many days after they are so weak that they cannot stand, and for two or three days, when they exhibit no other sign of life than of breathing, lying perfectly motionless.

An opinion has been advanced, that this disease has been introduced by the Merino breed, which ought therefore to be killed or banished from the country, before they communicate incurable and fatal diseases to our own native sheep. I am, however, in possession of evidence, which to my mind is conclusive, that this opinion is wholly unfounded. It is true, that I have lost but one native sheep; it is as true, that I have lost but one, that was more than one year old; and it is also true that I have none of

the native breed less than two years old ; and this disorder has not attacked any of my flock, but last spring lambs, except one native sheep somewhat in years. It does not therefore, appear that the merino or mixed breed are more subject to this fatal disorder than native sheep of the same class. I have still farther evidence on this point. The native ewe which I lost was purchased more than a year ago from a flock, among which a merino had never been. She died a few days since, having but few worms and those very large. From appearance, I have no doubt that she had worms before I bought her; her symptoms at that time I think warrant the conclusion. A number of years ago, before the merinos were introduced into the country, I lost five or six wethers of one year old, all I had of that age ; they died in the same way as those I lost lately. There is not a doubt in my mind, that worms in the head were the cause of their death. I have heard of a great number of sheep that have died in the District of Maine, of scouring, the winter past. Some gentlemen are of opinion that it is the same disorder that appeared among sheep many years ago under the name of rot. If it be the same disease, the merinos are clear from the imputation of having introduced the disease into the country.

I have seen no author, who treats of worms in the head, except Livingston. He says, " I lost an ewe one year old. She appeared bewildered and turned herself often, staggered, and pined away gradually. At the end of eight days from the time I observed her complaint, she died, very much extenuated, although kept in a piece of luscious grass. On opening her head I found the brain mortified, and extracted three white worms of about half an inch in length. I know no remedy." These could not have been the same kind of worms that I have observed. The symptoms were different, and I have in no instance seen the brain mortified. The worms were not upon the brain, but in the frontal sinuses (as medical gentlemen say) which are cavities between the two layers of the bone that makes the forehead.

Several of the last victims were ewes of the mixed breed one year old. A number more in my flock now show symptoms of the disease, none of which are more than two years old ; and I am not without apprehension that a great portion of my flock will fall a prey to this dreadful malady.

I shall make no comments upon the subject. I have stated the facts as nearly as I can. I think, however, that this disease is more to be feared than any that has attacked that useful animal since they were imported into this country.

It has been suggested that the worms are conveyed into the head by a bee, bug, or fly, leaving its eggs in the nostrils of the sheep. If such be the fact, how is it that we find some worms apparently but a few days old, and others, for aught that appears, several months old? Why are males more subject to the disease than females, and young sheep than old ones? These are queries which I am unable to answer.

Vassalborough, April 20, 1815.

EXPERIMENTS ON THE CULTURE OF POTATOES.

BY SAMUEL G. PERKINS, ESQ.

[To the Hon. Josiah Quincy, Esq.]

Boston, April 4th, 1815.

DEAR SIR,

AGREEABLY to your request, I have committed to writing the facts in relation to three potatoes, weighing eighteen ounces, which I planted the 27th of April, 1813. These potatoes were cut into ninety-four *sets*, each *set* containing one, two or three eyes, and were planted in two drills, each thirty-nine feet long, one half about fifteen inches, and the other half about seven inches distant from each other; the rows or drills were two and an half feet apart. The ground was good and the soil deep, but I put no manure upon it that season.

On the seventh of October, I caused the potatoes to be taken out of the ground and measured in my presence, heaping them as long as they would lay one on the other, and I found there were about four and an half bushels. With a view, however, to ascertain the precise increase, I weighed the whole parcel after separating those which were too small for the table, and found I had 255 pounds of large handsome potatoes fit for table use, and eighteen pounds of small ones fit only for cattle, making an aggregate of 273 pounds from one pound and two ounces of

seed, or 242 pounds for one. This would give upwards of 3140 bushels for every thirteen bushels of seed employed, which is about the average quantity planted on an acre of ground; but this, I conceive, is not the proper mode of estimating the advantages to be derived from planting these potatoes* in the manner adopted by me. There is, to be sure, a great saving of seed, which is of some importance to the farmer who raises potatoes in large quantities for cattle or for distillation; it will be seen, however, more in the ground employed, which was about ninety-seven square feet, or the 264th part of an acre, which last number, multiplied by $4\frac{1}{2}$, (the number of bushels raised on the ninety-seven feet of ground,) gives 1180 bushels to the acre; or if estimated at sixty pounds the bushel, is a little over 1200 bushels to the acre. This product, taken in conjunction with the saving of seed, may be of importance to the farmer.

I have before observed that one half the *sets* were placed about fifteen inches apart, and the other half were only seven inches distant. This I did with a view to ascertain whether those that were nearest together, would produce as abundantly as those which had more room to extend themselves, and I found, as I expected, that the *sets* which were planted farthest apart, produced much more abundantly than the others. Had the season been a good one for the raising of potatoes, and the *sets* been placed at eighteen inches asunder in the drills, I have no doubt I should have had at least six bushels from my three potatoes.

The experiment which I made last year with straw, as a manure for potatoes, I have not communicated to the Society, because it was not made with sufficient precision to establish the accurate advantage of the dry over the wet manure. As you have urged me to state the facts to you as they are, I have subjoined them. Last spring I caused two drills to be made in my garden of equal length, and three feet distant from each other in rather poor ground. At the bottom of one of these drills or furrows I placed some rotten hot-bed horse manure, on which I placed the *sets* of some potatoes which I had prepared, and levelled the ground over them. At the bottom of the other furrow I placed some straw which had served to cover my Strawberry

* These potatoes were given me by Mr. Tyng: they were white and full of eyes.

Vines, Carnations, &c. during the winter. This I covered over with a little earth, and planted the potatoe *sets* on it at the same distance, one from the other, which had been observed in the other trench. I then levelled the earth over them. and put stakes, which I marked, at the end of each row. My gardener, (a Scotchman) asked me what object I had in view, and when I told him it was to ascertain which manure would produce the largest crop, he appeared surprised that I should doubt. Finding me serious, however, he said I should see that the potatoes in the row with hot bed manure would be double in quantity and size over the others. When the vines first showed themselves, and for a month or six weeks afterwards, the row which the gardener had adopted as *his*, was much more vigorous than the one he pleased to call mine; and whenever I went to that part of the garden, he called my attention to the difference in the strength and growth of the vines in the two rows. His were, to be sure, much the finest; but as the dry manure began to decompose, my vines began to start, and every day gave me new occasion, in my turn, to call the attention of the gardener to the increase of the potatoe tops in my row, and the extreme vigour and length which they were constantly acquiring. This he saw with astonishment, if not with regret, until they were double the size and length of the others. From the great increase of vines in my row, I expected double the quantity of potatoes; but here I was mistaken and disappointed. My gardener, who took up the roots from the two rows under my eye, thought there were only a quarter part more in quantity; but he acknowledged they were much finer in appearance and size than those from the hot-bed manure. I did not weigh nor measure them, as I was at that time out of health and could not attend to the business myself. I am satisfied, however, from the experiment, that dry or undecomposed manures are much more efficacious and useful in many cases than those which have been rotted above ground, and thus lost, by evaporation, the greater portion of their strength.

It must be confessed that the great increase from so small a quantity of seed, as was planted in the instance first mentioned, cannot be expected in field culture. The soil is neither so deep nor so loose as in a garden constantly worked over with the spade, and of course the fibrous roots cannot extend themselves with so much facility; but, I believe great improvements may

be made in field cultivation as well as in gardens. When the soil is pretty deep and well broken up, great saving in the labour which is now bestowed in hilling potatoes, might be made. When the ground is hoed to destroy the weeds, a little earth drawn to the vines to protect the roots from drought will be better than to heap on loads of earth as is the custom among us. All that is necessary, in my opinion, is to keep the ground clear of weeds. I have practised this mode with success. If the preceding facts can be of any use to you, or if they will contribute to make 150 bushels of potatoes grow where 100 only grew before, I shall be amply paid for the time I have bestowed on the subject.

With regard to the experiment of the manure, I am of opinion that it will be best to try them once or twice upon a small scale before you attempt the planting of large parcels, that there may be no waste of seed, labour, or time, which would be considerable should it fail when tried upon a large scale.

Your obedient, humble servant,

SAMUEL G. PERKINS.

CROPS OF WHEAT RAISED IN DANVERS, COUNTY OF ESSEX, IN THE YEAR 1814.

[To the Corresponding Secretary.]

SIR, *Danvers, April 13th,* 1815.

AGREEABLE to a request of the Massachusetts Agricultural Society, published in the newspapers, I transmit you an account of wheat raised the last season in this town. I believe there was but one kind of wheat sown—the summer-bearded wheat, (Londonderry wheat.) It was sown on various kinds of land, differently managed, manured, and the products accordingly various. The greatest crop was raised on a sandy plain, highly manured, viz.: one bushel, sown on three quarters of an acre, produced twenty bushels. In this town there were sown twenty-nine and an half bushels, on twenty-four and an half acres of land—produce *two hundred and eighty-three bushels.* We are desirous of obtaining some of the seed of the Sea-Kale,

Woad, Madder, and the Fiorin Grass (*Agrostis procumbens*); could you furnish us with either, or inform us how to obtain them, you would much oblige the Danvers Agricultural Society.

Yours, &c.

ANDREW NICHOLS,

Corresponding Secretary.

WHEAT CROPS RAISED IN ANDOVER, IN 1814, WITH REMARKS ON THE CULTURE OF FLAX.

BY GEORGE OSGOOD, ESQ.

[To the Recording Secretary.]

DEAR SIR, *Andover, 14th January*, 1815.

A REQUEST having been made for information on the culture of wheat, I beg leave to communicate the successful experiments in this vicinity. Till within a few years farmers were discouraged from cultivating this valuable grain, from the uncertainty of the crop—wheat being more liable to blight than other small grains.

For sixteen years past I have sowed wheat, when I had in tillage suitable land, and have generally had twenty bushels from an acre. The land most suitable, in my estimation, for the cultivation of wheat, is land favourable for early vegetation. The old aphorism, "sow wheat in the fire," is, with some limitation, true; but what farmers call warm land, with a lively deep soil, is favourable to an abundant crop. It is of importance that spring wheat be sowed early in the spring. The quantity of seed for an acre is varied from five pecks to two bushels; six pecks to the acre, I believe, is the general practice in this town—lands weedy and of a deep rich soil require more. The seed is prepared by mixing with it fine ashes, and sprinkling it with water, daily stirring it, till the grain is enlarged.

Within a few years has been introduced a new species of wheat, called white wheat, and its never having blighted, has induced farmers generally to cultivate it; more wheat has been raised within two years past, than for twenty years before. A variety of soils have received it, and the average crops have been

twenty bushels from an acre. It has not only been exempt from blight, but the wheat has yielded a whiter flour, than the wheat heretofore cultivated. Forty pounds of good fine flour have been received from one bushel, after the usual deduction of toll for grinding and bolting. Such has been the encouragement, from abundant crops, the goodness of grain and its high price, that lands heretofore appropriated to the culture of rye, oats and barley, have been sown with wheat. How long we may be encouraged in the cultivation of this pleasant and useful grain, is uncertain. The experiments many years since, in the Siberian wheat, gave equal encouragement; but it soon became assimilated to our climate and soil, and was more subject to blight than our common wheat.

Having read the observations of Mr. Hallet and Mr. Morse upon the cultivation of flax, (although unsolicited,) I would make a few observations upon the culture of this useful plant, which I do, as a practical farmer. I shall not engage in controversy, but simply state reasons and facts.

I consider the two great enemies to flax are weeds and worms, which are abundant in our old cultivated fields, and therefore the crops are very uncertain in such lands. Most farmers have pasture lands, that need ploughing, either from the abounding of bushes, or from the hardness of the sward, or, as farmers say, "the land is bound out." Such land, if not too moist, sandy, or gravelly, when subdued by tillage, I found, by repeated experiments, is the most favourable to the cultivation of flax, and is seldom annoyed by the forementioned enemies. It is an encouragement to cultivate such land, were it only for a flax crop; but the judicious farmer will be anxious to cultivate such land from other motives. The manner of preparing the ground for flax is of some importance. Shallow ploughing, and much harrowing to pulverize the surface of the ground for the reception of the seed, I have found favorable to an abundant crop. Flax has short roots, but it requires a soft, fine bed, and vegetation should not be impeded by a cloddy surface.

The time of sowing flax is of considerable importance. If sowed in May or June, the vegetation will be too rapid; and although you may have a great crop of stalks, the proportion of flax will be small. It has been said by old farmers, that March *tow* is better than May *tier*—(the last term is flax from the hatchel.) It is observed of those trees which are of hasty growth, that the bark is thin, and vice versa. The bark of the flax plant

is what we call flax; and if we may be allowed to reason from analogy, the coat of the flax stalk will be thicker when of slow growth. The middle of April I have considered the proper season for sowing flax; but it must depend upon the early or late advance of the season—some years it may be sowed earlier, and other years later. There have been various opinions respecting the seeding of the ground. The common practice in this vicinity, was sowing two bushels of seed to an acre; but a few sowed less, and some only one bushel. From observing the variety of experiments, I sowed five pecks of seed on an acre—my crop was four hundred pounds of well dressed flax, and eight bushels of seed. Some who have sowed one bushel, have raised six hundred pounds, and an increased proportion of seed. As I have for several years been ploughing my bushy pastures, I have yearly sowed with flax from one to two acres, with nearly equal success.

There are several important reasons for thin seeding. The plants are not so apt to lodge, and the seed is better and more; and when commerce was free the seed was of considerable importance.

When my pasture lands are properly tilled, I wish to sow in grass seed, and if the flax stalks are thick, they destroy the young plants; but in the manner I sow, the subsequent crop of grass is as great as from sowing grass seed with rye or oats. But one very important reason is the facility with which large stalks are dressed. A man skilled in swingling will swingle from forty to sixty pounds a day, in the month of March; whereas the same man would not swingle more than fifteen pounds from the flax of fine stalks.

It may be objected that coarse flax will not make fine yarn. But what are the most profitable manufactures in New-England in a time of peace? Are not coarse cloths? Such flax is suited to the common manufactures of the farmer, shoe maker, harness maker, and sail maker. From such flax I have had made cloth seventy knots to the yard, and finer is not profitable where labour is as in this country.

Much attention is requisite in the bleaching of flax; and neglects here, have often nearly destroyed a good crop. Many farmers delay spreading their flax, till frosts; and many who spread early, suffer it to lie too long on the ground. The careful farmer, will watchfully attend to the seasons and the bleaching.

GEORGE OSGOOD.

MEMORANDUM OF THE QUANTITY OF WHEAT RAISED IN NEWBURY, THIRD PARISH, IN 1814.

[Communicated by John Osgood, Esq.]

In the third parish of Newbury, the wheat sown was one hundred and seventy-eight bushels on eighty-nine acres. Produce from the above, one thousand nine hundred and fifty-six bushels.

JOHN OSGOOD.

December 1814.

ON OIL AS A MANURE.

BY C. BALDWIN, ESQ.

[From Hunter's Georgical Essays.]

Having for many years considered oil as the great pabulum of plants, I was much disappointed at the result of some experiments, from which it would seem that oil was a poison ; and turning the subject frequently in mind, it at last occurred to me, that though oil in a crude state might act as a poison, it might be so changed as to convey it with great advantage to the soil, and I instantly recollected Dr. Hunter's mode by ashes ; it also occurred to me, that rape oil cake was known to be an excellent manure, that no objection had ever been made to it but its expensiveness, and that if it was beneficial to the soil, it could only be so from the quantity of oil contained in it, though that quantity must be very small indeed, considering the process of first grinding the rape seed, and the rash force used to drive out the oil, so that what remains is little more than a *caput mortuum ;* yet the cake formed of these very remains is known to be a rich manure.

Think for a moment from how many seeds, plants, shrubs, and trees, we draw oil ; from rape seed, linseed, mustard, fennel, aniseed, juniper, caraways, mint, olives, &c. Thus we evidently draw an immense quantity of oil from the earth, but how and when do we convey any to it ? I know of little or no attention paid to this circumstance in our compost dunghills, so that all the oil conveyed to them can only be from animal dung.

Whatever may be the quantity of oil remaining in each rape cake, (and I believe that no one will state it at half an ounce each,) yet it must be remembered that after all it is only a *vegetable* oil; reflecting on this circumstance, and fully persuaded that *animal* oil must be superior to it, I directly went to town to inquire the price of whale or train oil, and there I was informed, that it was about two shillings and eight pence per gallon, this I considered as too expensive; but pursuing my object, I was informed by Mr. Wilfred Read, oil merchant, that he could supply me with bottoms or foots of oil, and a rich, thick South Sea whale oil, at fourteen pence per gallon. This was the very thing I wished for, and directly ordered sixty gallons for a five acre field, and thus went to work. Having a platform or bottom of twenty loads of mould with eight loads of dung on it, I carried on three loads of light sandy mould, and one load of brick and mortar rubbish ground fine, and having mixed these well, and made a kind of dish of it, about five feet wide and ten feet long, with a ladle we put over it one half of the oil. It was in August, and the heat of the sun soon made the thick oil soak into this compost, when it was directly thrown up in a heap, broke down again, and by five or six turnings well mixed together, and left in a heap two days, when it was spread equally over the whole dunghill; twenty loads more of good mould were then carried on, eight loads of dung, and the remaining thirty gallons of oil were mixed as before, in sandy mould and brick and mortar rubbish, and equally spread over, and the whole was covered by trimming the four sides of the dung hill and throwing it on the top.

Thus the dung hill lay more than two months, when it was cut down by mattocks, carefully broke, well mixed and turned over. The end of March, it was carried on the fields, spread and ploughed in; it lay about a fortnight, was then ploughed again, and on the 22d of April last, it was drilled with the Rev. Mr. Cooke's most excellent drill; I mean his last, with hoes and scarifiers, which I think much superior to his former one: the last, I think every farmer who has seen it at work will consider it as incapable of further improvement. The field was drilled with barley, two bushels to the acre; the crop came up in a most even and beautiful manner; every seed was up within forty hours of each other; all were ripe at the same time, and, from a

couple of months after seed time to harvest, was rated by all who saw it, and it was seen by many, as a sixty bushel crop.

At harvest, three rows were cut across the field, directly threshed and measured ; one load out of thirteen was also threshed and measured, and both stated the crop to be sixty bushels. But to wave all possibility of doubt or dispute, I am contented to state the crop at seven quarters per acre.

As to the quality of the barley, I could here cite the opinion of one of the most eminent brewers in London, who saw the crop growing, and declared he would readily give £1000 to be assured that all the barley crops in the kingdom were of equal burden and weight ; five quarters of it have lately been sent to Nathrapps. in Norfolk, as seed barley, under the denomination of fifteen comb barley, weighing fifty-five pounds per bushel of Winchester measure.

It is well known that all animal substances, in a state of corruption, wonderfully promote vegetation, and are the actual food of plants.

Whether I used oil enough, or what is the proper quantity, experience must decide. Say I used twelve gallons of oil to eight loads of mould and four loads of dung per acre.

That oil applied to land as a food for plants, in its crude state, acts as a poison, I cannot deny ; but my process is very different ; I believe that oil, particularly animal oil, as before remarked, is the pabulum of plants—that is, oil subtilized by the salts in a compost dunghill, left there for a considerable time in a state of putrefaction, and until the whole has become putrescent, then it is believed to be the richest possible manure.

The barley evidently proved its excellence. A ridge of summer cucumbers in my garden pointed out to many its great power.the leaves being in general from ten to ten and an half inches broad, and the vines occupied an uncommon space of ground. Five hundred cabbages planted by the side of four thousand more, and with only one handful of the oil manure, put into each hole by the dibble at the time of planting, were evidently near as big again as the others.

INQUIRIES ADDRESSED TO FARMERS.

[With a view to collect the most accurate information on the principal branches of agriculture, as now practised, the following queries are addressed to intelligent farmers and to Societies instituted for the promotion of agriculture. The answers subjoined are from the Danvers Agricultural Society.]

Danvers, January 14th, 1815.

[To the Trustees of the Massachusetts Society for Promoting Agriculture.]

GENTLEMEN,

Since the formation of the Danvers Agricultural Society considerable time has elapsed; you have perhaps been disappointed in not receiving communications from us sooner. We have not however been entirely idle. The answers we now send to your questions are the result of considerable labour. We have had many different opinions to consult and reconcile. They have been discussed repeatedly at our quarterly meetings, and should they prove neither interesting to you, or the public, as friends of agricultural improvement it will afford you some satisfaction, to be informed that they have been advantageous to ourselves.

ANDREW NICHOLS,
Corresponding Secretary.

Question 1. Of what quantity of land do the farms in your vicinity generally consist?

Answer. The farms of those who make agriculture their entire occupation, contain from forty to one hundred acres; and will average about seventy-five acres. There are many who follow gardening, that cultivate from five to twenty acres.

Q. 2. What is the quality of the soil?

A. The land is generally uneven. Where it rises into large swells the soil is strong and moist, in most places full of stones, which render it hard to cultivate; but when it is subdued, it yields a crop proportionate to the labour. There are also several plains of considerable extent, some of which are sandy and others clayey. There are likewise many swamps and low fresh meadows.

Q 3. Into what portions of pasture, mowing and tillage, orcharding and wood, are farms usually divided? Are the orchards

improving or declining? Do they yield a competent supply of cider?

A. Mowing, tillage, and orcharding, constitute about one third part, pasturage one half, and wood land one sixth. Orchards are in a thriving condition; much attention has been paid to them within the last fifteen years. The young orchards are generally grafted, of which the best apples are not made into cider. More cider is however made than the farmers consume, but not sufficient to supply the inhabitants of the town.

Q. 4. How much land on each farm is annually (on an average of years) planted or sown with grain of any kind?

A. On a medium farm there are planted and sown with grain from eight to twelve acres.

Q. 5. In what manner is the land prepared, manured, and seeded with each kind of grain, and what is a medium crop?

A. For Indian corn, the land is usually ploughed once, and broken to pieces with a harrow. The manure is generally placed in hills about four feet apart, and the seed dropped upon it. It yields from twenty-five to forty bushels per acre. For barley, which is the principal grain sown, the land which had been for one or more years previous planted with corn or potatoes, is prepared by ploughing twice and harrowing once. Two bushels of seed are sufficient for an acre, which yields about twenty bushels. Within two years some attention has been paid to the cultivation of Londonderry wheat but not sufficient to determine whether it will be more or less profitable than other kinds of grain.

Q. 6. In what manner is Indian corn cultivated, and what is the medium crop on an acre?

A. After preparing the ground as above mentioned, Indian corn is planted in hills about four feet apart; and is usually hoed three times. It is usually planted in the month of May. Some attention is paid to the selection of seed; the best part of the soundest and fairest ears is chosen. The stalks are cut as soon as the kernel is fairly filled and turned; if they are cut sooner the corn is injured. It should remain in the field till fully ripe, for no where else will it dry so well as on the stalks.

Q. 7. What is the quantity and value of the straw on an acre of barley, rye, oats, and wheat *respectively?* And to how much upland hay are they *respectively* equivalent for fodder?

A. Of barley and oats, from one to one and an half tons, equivalent to one third the quantity of upland hay. Rye and wheat are very little raised.

Q. 8. What is the value of straw of each kind, for any purpose, *other than fodder or litter?*

A. So little is used for other purposes as not to enhance its value.

Q. 9. What is the value of the stover or stalks on an acre of Indian corn, and to what quantity of upland hay is it equivalent for fodder?

A. From eight to twelve dollars—equivalent to one half the quantity of upland hay.

Q. 10. What quantity of land, on a medium farm, is annually planted with potatoes? How is the land prepared? What quantity and kind of manure is applied to an acre, and in what manner? How much seed is used, and how is it selected? How are they cultivated, and what is a medium crop?

A. From one to one and an half acres, on a medium farm, is annually planted with potatoes. The land is prepared by ploughing once and harrowing. From ten to twelve ox cart loads of coarse manure put into holes on an acre. The potatoes are dropped on the manure in bills from three and a half to four feet apart. Not much attention is paid to the selection of the seed generally, although it would doubtless improve the crops to plant the largest and fairest only: about twelve bushels are allowed to an acre. Ploughed and hoed twice: an acre produces from one hundred and thirty to one hundred and eighty bushels.

Q. 11. How many bushels of potatoes are equivalent, ordinarily, to one bushel of Indian corn, for sale?

A. Potatoes sell from thirty to forty cents per bushel—the price of corn has been much more fluctuating: the price of the two articles therefore, at present, admit of no comparison.

Q. 12. How many days labour of a man, are usually employed on an acre of Indian corn, including the getting in all the stover and stripping the husks from the ears?

A. From fourteen to seventeen, exclusive of a team.

Q. 13. What is the labour of shelling a hundred bushels of Indian corn, and in what manner is it performed?

A. If threshed, which is the quickest way, from three to four days.

Q. 14. How many days labour of a man are usually employed on an acre of potatoes, including the getting in the crop?

A. From ten to fourteen, exclusive of a team.

Q. 15. Is there any order or succession of crops known to be beneficial or pernicious to the soil?—If any, what is it?

A. Any crop taken from the soil is supposed to impoverish it, excepting grain when the stubble is immediately ploughed in. Some crops injure the soil however much more than others.

Q. 16. What is the usual course of crops?

A. Grass ground is usually ploughed up in April or May, sometimes in the preceding autumn, and planted with corn or potatoes two or three years; it is then sown with barley generally, sometimes with oats or flax, and grass seed, clover, herd's grass, and red top.

Q. 17. What is the medium quantity of hay produced on an acre of upland, and what is the labour of mowing, curing, and housing it?

A. From fifteen to thirty hundred; labour from three to four days.

Q. 18 What is the medium product of hay on an acre of fresh meadow, and what is the labour of mowing, curing, and housing, or stacking it?

A. From fifteen to twenty-five hundred; labour about three days.

Q. 19. What is the proportion of value which fresh meadow hay bears to upland hay, each being of a medium quality?

A. About one third.

Q. 20. Is any tillage land laid down with grass seeds without sowing grain at the same time? If so, which method is found best?

A. Seldom if ever.

Q. 21. What are the kinds of grass cut on the upland for hay? What proportion is from seed sown by hand, and what are the kinds thus sown, and in what quantities *respectively* per acre?

A. Herd's grass, red top, spear grass, red and white clover, mixed with a variety of other grasses natural to the soil. The proportion of grass from seed sown by hand, it is impossible to calculate with any useful degree of accuracy. The only kinds sown are herd's grass, red top, and red clover. The proportion in which these seeds are generally sown, is herd's grass six quarts, clover three pounds, and red top three quarts.

Q. 22. Are any grass lands *new* seeded after scarifying them with the harrow only, or in any other mode, without ploughing? And what is the success of such practice?

A. We are unacquainted with any such practice.

Q. 23. What weeds, vermin or insects infest the mowing lands?

A. White Weed (Chrysanthemum Leucanthemum,) Flea Bane (Engeron Canadense,) Yellow Butter-Cups (Ranunculus Aeris,) Wood Waxen (Genista Tinctoria) most troublesome in pastures ; St. John's Wort (Hypericum Perforatum,) the Canada Thistle (Cnicus Arvensis) is beginning to make its appearance by road sides. Whether it will spread in our soil with the rapidity it has elsewhere, or not, is yet unknown. Farmers would do well to watch the movements of this formidable enemy. It is distinguished from all other thistles by its small leaves, small purple flowers which are numerous, and by their being no prickles on the heads (Calyx.) White Grass,—worms and grasshoppers.

Q. 24. Are the spontaneous or cultivated grasses infested most ?

A The spontaneous woodchucks are very destructive to red clover.

Q. 25. What methods are used to destroy weeds. vermine or insects without ploughing the land, and what is their success ?

A Wood ashes and salt mud are frequently spread over land to destroy weeds, vermine or insects with considerable success.

Q. 26 What kinds of beasts, and in what numbers are they respectively kept, on medium farms ? And how are they subsisted ?

A. On a medium farm there are usually kept one horse, one pair of oxen, seven cows and six sheep. These are usually purchased at an age fit for the team or dairy, and consequently but few young cattle are kept. Horses and horned cattle are pastured in the summer, and fed on hay, stover, straw, grain, carrots, turnips, pumpkins and potatoes in the winter. Concerning hogs, *vide* answer to question 33.

Q. 27. In what place and in what manner are the cattle fed with the coarse winter fodder ? Is it given in the stable, in the yard, or in the field ? Is it chopped or given whole ?

A. Cattle are fed in the stable at night and in the yard with the coarse fodder during the day. Fodder of any kind is seldom chopped. The coarsest is given first ; the best is generally reserved for spring.

Q. 28. How much butter is usually made in a year from a cow, all the cream being churned ? And how much skim-milk cheese is made from this same cow ?

A. One hundred pounds of butter and fifty of cheese.

Q. 29. What food is given to sheep besides grass and hay ?

A. A small quantity of grain, turnips, carrots and potatoes.

Q. 30. What is the value of the subsistence of a sheep through the year, besides the pasturage ?

A. While the ground is bare, many farmers suffer their sheep to graze in the day time. In such cases the expense cannot be accurately calculated. Where they are well kept, housed and in yards, the expense is not less than three dollars. They will eat two pounds of hay daily, besides a gill of grain and as much of the above mentioned vegetables.

Q. 31. What is the value of pasturage for a sheep compared with the pasturage of a cow ?

A. Three sheep and their lambs will eat as much as a cow.

Q. 32 What is the ordinary weight and value of the flesh of a sheep when fit for the butcher ? And what is the quantity of wool in a fleece ?

A. Sheep on an average weigh about forty pounds, worth two dollars in market ; the tallow and skin without the wool will pay for marketing. The fleeces weigh from one and an half to two and an half pounds.

Q. 33. What breed of swine are propagated ? How are they fed ? How fatted ? At what age are they killed ; and what do they then weigh ?

A. The common hog, a few of the Chinese and a mixture of the two breeds. They may be divided into three classes. 1st, Spring pigs, which are killed when about nine months old. These are kept on the wash of the kitchen and dairy in summer, and fatted on corn and meal in autumn, and weigh from one to two hundred. 2d, Such as are purchased out of the droves from the interior of the country, in autumn and winter. These are kept on the refuse of the kitchen, and potatoes in the winter, and on the same as the first mentioned class in the summer and autumn, and are killed when from eighteen to twenty-one months old, and weigh from two to three hundred. 3d, The same as class first, but kept in the same manner as the last mentioned until theyare about twenty-one months old, and weigh from three and an half to four hundred.

Q. 34. What number of bee hives are kept ? What is their product in honey and wax ? What is the management, and what are the obstacles which discourage their extensive propagation ?

A The number of bee hives kept is small. Their product is also small compared with what it formerly was. The hives

are made of boards, set in a warm place fronting the south, sheltered from the wind and from the sun in the summer. They are allowed to swarm and are hived in the usual manner. Some years since, to prevent their swarming, some placed empty hives under the full ones: this is however now seldom practised. In taking the honey, the bees are uniformly destroyed by the fumes of sulphur. They afford but little profit. This may be owing to several causes, two are obvious:—there are a large number of stores of West India goods in this vincinity, where great numbers of them are annually destroyed—birds have increased which are known to prey upon them. Notwithstanding these obstacles it is not improbable, that if the owners would acquaint themselves more thoroughly with the natural history of this valuable insect, and with the bee master's science, such improvement might be made in the management of them as would amply compensate them for their time and trouble.

Q. 35. What is the usual quantity of land sowed with flax seed? How is it manured and cultivated; and what is the medium produce of flax and seed in quantity and value?

A. About one fourth of an acre. A rich soil well manured the preceding year is generally chosen. It is prepared by two or three ploughings. One and an half bushels of seed are usually allowed to an acre. One fourth of an acre produces about sixty-five or seventy pounds of dressed flax, and about two and an half or three bushels of seed. The whole worth about sixteen dollars.

Q. 36. How much labour is employed on a quarter of an acre of flax, before it comes to the spinner, and including the preparing the seed for market?

A. The labour of cultivating, preparing and dressing one fourth of an acre of flax is about ten days; a large proportion of which is done in the winter.

Q. 37. In what articles consists the surplus of the farmer, which is sold or exchanged for other articles?

A Hay, corn, potatoes, barley, pork, beef, butter, cheese, cider, apples, and poultry.

Q. 38. How many loads of manure are collected (estimating thirty bushels to a load,) from the cattle in the barn yard, of a medium farm, in a year, specifying the number and kinds of cattle kept on the same farm, and the manner in which they are kept in relation to confinement or ranging abroad?

A. On a medium farm, on which are kept one horse, one pair of oxen, seven cows, and six sheep, the usual quantity is from forty to fifty loads, where the cattle are confined to the yard during nights in the summer, and in the winter the greatest part of the time.

Q. 39. What quantity of manure is made in the hog-pen? specifying the number of swine fatted, the kind and quantity of food consumed, and the weight of flesh produced?

A. In a hog pen, where two hogs are kept, about eight loads. Some however make much more. Respecting the kind of food, &c. vide answer 33.

Q. 40. What methods are used to enlarge the quantity, improve the quality, or prevent waste of the manure, made in the barn-yard or hog-pen, and especially to save the stale of the cattle?

A. To enlarge the quantity of manure and save the stale of the cattle, the yards when cleared are covered with rich mould taken from places which receive the wash of roads, &c. Coarse hay, weeds, &c. are occasionally thrown in: and to improve the quality, sea weed, and sometimes lime are added.

Q. 41. Is the manure and tillage labour exclusively applied to the best parts of each farm?

A. It is the common practice to plough, till and manure all the upland mowing ground in succession.

Q. 42. In what manner and for what purposes is manure used, except those indicated in the foregoing inquiries?

A. Manure is frequently spread on mowing lands, and is also advantageously applied to young fruit trees, once in three years.

Q. 43. What other manures are used besides those created by the stock, and what are their merits compared with these?

A. Leached ashes, peat ashes, and salt mud taken from the flats and muscle beds, are all good manures. Sea weed and rock weed are used as a manure for potatoes, and are sometimes spread on grass land, but are more frequently thrown into barn yards and hog pens, to increase and improve other manure.

Q. 44. Is lime-stone found in your vicinity? Is it used as a manure?

A. None found.

Q. 45. Is Buck-wheat cultivated for the food it yields? or is it used to cleanse the soil from weeds, to fertilize and enrich it, or for any other purpose?

A. Buckwheat is sometimes cultivated for a green dressing, and is ploughed in, and the ground planted with potatoes about the 10th of June.

Q 47. How is land cleared, which bushes and under-brush have over-run, since the trees were carried off?

A. By mowing, burning, ploughing and planting potatoes?

Q. 48. What is done with swamps, or swampy lands?

A. They are drained, the bushes destroyed by repeated cuttings, and if unfit for peat, are sometimes covered with gravel, four or six inches thick, and sown with grass seeds. Generally, however, the bushes being killed, they are left in this natural state, to produce coarse fodder.

Q. 49. Is the growth of wood for timber and fuel equivalent to the consumption in your vicinity? If not, what measures are taken to provide against the inconveniences of future scarcity?

A. It is not equivalent to the consumption in this vicinity. The means of providing against future scarcity are propagating the locust in our pastures, which not only grows rapidly and produces the most valuable kind of wood, but also increases the quantity and improves the quality of the seed. Improvement in the construction of the houses and fire places and the general use of peat.

Q. 50. Are wood lots generally fenced, or left open for cattle to range in without restraint? In getting your wood for fuel, do you pick the oldest trees, or do you cut clear? Which method is best calculated to increase the value of your wood lands?

A. Young wood is generally protected by fences from horned cattle. On the other question, farmers are divided in opinion and in practice. Perhaps much depends on the kind of wood and wood-land. Where the wood is all growing and the calculation is to save it for fuel only, it may be as profitable or more so to cut clear. Where many of the trees are decaying, or the object is to save valuable timber, it will do much better to pick out the decaying, and thin the crowded places.

Q. 51. What are the causes that the culture of wheat can no longer be pursued on the sea coast of New England?

A. The easterly winds are supposed to blight it. The seed raised in this vicinity does not answer so well to sow again as that brought from a distance. Barberry bushes, which are plenty in this town, have been supposed, both in Europe and America, to injure grain. "This some distinguished philosophical agriculturalists have declared unfounded." Some of our farmers, how-

ever, assert from observation, that not only wheat and rye, but also barley is essentially injured near barberry bushes. The subject is worthy further investigation and experiments.

Q. 52. How far has Gypsum, (Plaster of Paris,) been fairly tried as a manure in the maritime parts of this state? What have been the effects of the experiment?

A. Gypsum has been but little used in this vicinity; it has been tried and proved not beneficial.

Q. 53. Is the European practice of a succession of crops found to be expedient in this country, and in what order ought such a succession of crops to take place?

A Succession of crops is generally practised, excepting on low, wet lands. The order that generally prevails is as follows:—First, and frequently second year, corn or potatoes—the year following barley, oats or flax. Sometimes the stubble is ploughed in soon after taking off the crop, corn planted the next year, and the year following sown down with barley, or oats and grass seed.

Q. 54. Is it perfectly ascertained, that with attention to manuring the land, it is more advantageous to change the crops than to keep it in grass?

A. It is found necessary to change the tillage lands on account of their becoming weedy. Low and moist lands occasionally manured, are more profitably kept in grass.

Q. 55. Is there any crop so profitable as grass, taking into consideration the state of markets in our country, and the distance that most of our farmers are from market?

A. In this vicinity no crop is more profitable than grass.

Q. 56. Can farmers raise any crop which, on the whole, affords them so great a profit as grass, unless they are within twenty miles of the capital?

A. Not applicable to us.

Q. 57. What are the most profitable crops which the state of Massachusetts, taking one year with another, furnishes?

A. In this vicinity Indian corn, potatoes, carrots, onions, and grass.

Q. 58. What has been found to be the difference of profit between the Merino sheep, and the sheep which formed our former stock?

A. The subject of this question has not yet been so correctly ascertained as to authorize an answer from us.

Q. 59. Is there any cheap fodder which can be raised for sheep during the winter, which will supersede or diminish the consumption of hay?

A. Wood Waxen (Genesta Tinctoria) was imported for this purpose. It has overspread and rendered of little value, thousands of acres of land in this vicinity. Sheep will eat it, both green and dry, but if kept entirely upon it, although it will keep them in flesh, it is said to render them weak. Could it be confined to barren lands, for it flourishes where nothing else will grow, it might be valuable; but its encroachments on land more valuable for other purposes cannot be restrained without much care and expense.

Q 60 What is the comparative profit of a farm adapted to the raising of sheep, between the cultivation of Merinos, and the raising of any other cattle?

A. Not ascertained.

Q. 61. Is there any profit derived from the raising of Indian corn, except for the subsistence of man, which can equal the employment of the same land in raising grass for the support of sheep and cattle during the winter? What are the calculations on which such profits are founded?

A. It is considered profitable to give horses, oxen and sheep Indian corn. The working cattle will be enabled to perform enough more, and the fleeces of the sheep will be so much improved thereby, as to pay well for the extra expense. It is not generally given to other cattle, although the profits of the dairy would probably be increased thereby. No particular calculations, however, have been made on the subject.

Q. 62. What are the improvements in dairies, which have been made within the last twenty years? Is the quality of butter and cheese improved? And in what consists this improvement? And what are its causes?

A. None; not generally known.

Q 63. Are there any improvements in the tools of husbandry, which experience has confirmed, and what are these improvements?

A. None.

Q. 64. Are there any new and valuable fruits or productions, either contributing to the pleasure or profit of the citizens at large? What are they? What the mode of culture, and what their qualities?

A. None.

Q. 65. Are there any improvements in the breed of cattle? What are they, what their qualities, and where can they be obtained?

A. None.

Q. 66. Are there any other improvements, not comprised under the articles of manufactures, which have been made in any branch of agriculture?

A. None.

P. S. We expect soon to send you an answer to your inquiry respecting the quantity of wheat raised in this town.

Yours, &c.

ANDREW NICHOLS.

ORIGINAL LETTER FROM JUDGE PETERS OF PENNSYLVANIA, WITH REMARKS ON THE CULTURE OF CHICCORY, THE MANGEL WURTZEL OR SCARCITY ROOT, &c.

[Addressed to the Hon. Josiah Quincy, Esq.]

DEAR SIR,

It is very difficult to obtain materials for any agricultural publication, either original or foreign. The first is precluded by the general disinclination of farmers to write on the subject, though they will consume hours in relating their own performances. One may pick up some information from them in this way; but new or useful facts are *rari nantes in gurgite vasto.* In a country society in my neighbourhood, we follow the Connecticut mode. Every one gives, in turn, a verbal account of any circumstance that has happened under his observation, of an agricultural nature, since the last meeting. The secretary sets down, in a rough minute book, the substance of the information. Every year selections of the facts are, (or ought to be) made. We are put to the necessity of filling up our volume with foreign matter, some of which is preferable to domestic communications. It is certainly a mark of illiberality and folly, to reject knowledge and information, because they were the growth of a foreign country.

I am pleased with your perseverance in your *soiling* plan, because it will test its utility or disadvantage. I sent to you the chiccory seed for trial, as it is so highly spoken of by A. Young and other British writers, as well as German and French agriculturalists, as a plant for soiling preferable to all others. It is no favourite of mine. A. Young assisted in getting the seed, part of which you have. I have it growing in my garden, luxuriantly. The root is a fine winter esculent, when the pith is disengaged. Plant the roots in a tub, and place it in a warm room in winter, and the roots throw up profusely a fine sallad. In foreign countries an imitation of *coffee* is made, by grinding the dried and burnt roots, and mixing a little real coffee with the ground roots. See Young's annals, and judge for yourself.

You will see what I know about the *mangel wurtzel.* I have never heard of any one else, in this country, who has given it a fair and persevering trial. I have not equalled the English or German cultivators; but I am perfectly satisfied with what I have actually experienced. Last year I failed, from having planted it in improper soil, (too light and sandy;) and if any other had failed, as I have done, the root would have been pronounced good for nothing. The roots of my last crop are better than carrots, turnips, or parsnips, which I have raised extensively in field culture. But they are inferior to *good* scarcity roots. Those are the worst which I did not strip. In compliance with the suggestions of the objectors to topping carrots, I have had carrots, in great quantities, as thick as my arm or small of the leg. I do not remember to have *cut* the tops off, but I always *strip* them, leaving the heart leaves at the *last cleaning.* I frequently trample or roll down the tops of luxuriant carrots and parsnips, and they yield a far superior root. *Your* experiment contradicts my experience. It seems a very fair trial, and not to be doubted as to its result. Try *stripping*, and omit *cutting*, and do it about the middle of the season. When the tops are too young, I know taking them off is injurious. Much depends on the state of the plant. Over-luxuriance in the tops, always causes inferiority in the root. Sometimes potatoes are wonderfully increased in size, by mowing off the tops. At other times, I have known them entirely ruined by it. There must be some state of sap or season, good or bad for such operations. When will agriculture be a *science*, teaching fixed principles? For a period of two thousand years, at least, it has

been an *art*, enlightened only by individual facts, too often clashing and ill defined.

Very sincerely yours,

RICHARD PETERS.

REMEDIES FOR CERTAIN DISEASES IN SHEEP.

BY A MEMBER OF THE EAST ANDOVER AGRICULTURAL SOCIETY.

[Communicated by that Society.]

[We refer the readers of this article to some remarks of Chancellor Livingston "on the excretory duct in the feet of sheep," which may be found at page 163 in No. 2, of this volume of our Journal.]

It is a maxim generally admitted, that "in the progress of investigating any subject, we ought to proceed from known facts to what is unknown." And we are as often perhaps mistaken as to the facts, as we are in our theory. It is therefore by no means surprising, that in our inquiries we are often forming suppositions instead of just conclusions. "Those suppositions being handed down from age to age, acquire additional weight from the authorities by which they are supported, till at last they are received as fundamental truths;" whereas we ought to trust to nothing but facts. Thoroughly convinced of these truths, and wishing them to be strongly impressed on my own mind, as well as on the minds of others, has led me to the above introduction on what I have to offer for your consideration on some of the common diseases of sheep.

In the early part of the last summer, while I was engaged in making some observations and experiments on sheep, I was informed by one of my neighbours that it had been lately observed to him, that the dysentery or flux in sheep was readily cured by simply rubbing with a "cob between the sheep's hoofs." On examining a sheep, which had been suffering with that disorder for two months or more, there appeared in the chink of the skin just above the hoof an orifice sufficiently large to admit a large sized knitting needle, and there was a kind of wax-like substance covering the mouth of the orifice on each of the feet, which I removed, and then rubbed the parts freely with a cob and woollen cord, and kept the sheep in the barn till the next day, and

then repeated the operation, and turned him to the flock without using other means. Nothing since has appeared of the disorder, and the sheep came to the barn this winter quite fat.

Since which I have examined many sheep, and have generally found at the mouth of those orifices and quite up into the opening, the same kind of matter, more or less inspissated. Late this fall, in two of my sheep that appeared unhealthy, one of which had a bad cough, I opened the mouths of those drains, rubbing the parts freely, since which they appear quite healthy and vigorous, and no other means were employed. After mentioning the circumstance to my neighbours, one of them informed me, that on examining one of his sheep that was quite sick, and (as he supposed) would soon die, he found that the substance lying in the mouth of the orifice had become so dry and hard, that it "broke like a dry stick." He removed the substance, gave the parts a faithful rubbing, doing nothing else for the sheep, which in a few days got well, and has so remained. Whether the return of health in those sheep has been produced by this simple remedy, or some other cause, I do not undertake to say; but I am inclined to believe, that nature has designed those openings as salutary drains, and when once obstructed, may become the cause of various disorders. And may I hope that the above hints may be a means of calling the attention of those, whose leisure and talents will bring the truth to light?

It has by some persons been said, that the merinos are more subject to disorders on the skin than our common sheep. Whether that is, or is not the fact, I will not undertake to say, from the little experience I have had on the subject; but will state only the remedies I have used in their disorders, and what *appears* to be the effect.

Sometime in the latter part of July last past, we discovered that one of our best half blooded merino lambs was very sick, and on examination, found the back covered with large live maggots; and on searching for the cause, I thought I had discovered several punctures, and concluded they were made by the dog. As I have been much pleased with the effects of using smoke in punctured wounds, and as I concluded the smoke would readily destroy maggots, I was at once determined to try it. The maggots were sooner killed than I expected where the smoke of the tobacco was forcibly thrown by the pipe to the parts. The sheep had become so poor and sick, as to be hardly able to stand, and

were kept in a close by the house, and smoked every day, for three days, with tobacco and woollen rags. I then washed with salt and water, sheared off the wool to discover the wound, and found I was mistaken in my first conjecture; for instead of a wound, I found an inveterate disease on the skin, extending from the hips to the shoulders, with a free discharge of matter that had spread down the sides of the sheep. I found also, that where I at first suspected a wound, and had applied the smoke more freely, the discharge was drying away. I continued the smoking with old woollen rags, and occasionally washed with soap and water. The wool in a short time was entirely off from his back, and partly down the sides where the skin appeared dry and hard; for which I applied an ointment of hog's fat, mixed with flour of sulphur, and kept him tied for about ten days, that the disease might not be communicated to others of the flock; I then turned him out well, and he has remained so to this time, and was selected a short time since by one of my townsmen among six others, as the best to put to his ewes this season. I gave no other medicine, and used no other remedy. Soon after my sheep got well, one of my neighbour's sheep was taken with the same disorder, though not yet so bad—the same remedy was applied—the disorder soon gave way, as we think, to the smoke, and in a few days was well.

In a wound on the head of a sheep made a short time since by a dog, the teeth of which had penetrated deeply at the ear and at the eye, and at other places several smaller lacerated wounds were made, we applied the smoke with every appearance of the like good effect.

I am the more inclined to have a confidence in the above remedy from believing in the antiseptic quality of smoke, which may possess or convey a considerable quantity of the carbonic acid gas, as well as from the astonishingly penetrating powers of smoke as such. But I forbear to reason on the subject, leaving that for men of learning and of leisure, contenting myself with simply stating what have appeared to me as facts—hoping the remedy may have a fair trial that the truth may fully appear.

To the Trustees of the Msssachusetts Society for Promoting Agriculture.

GENTLEMEN,

I AM this moment requested to give a copy of the above, to be sent by Mr. M. Morrell, of this town, to your Society. Want of time prevents my copying and correcting it. If sent at all, it must go with "all its imperfections." I shall not attempt an apology, for I have, gentlemen, attended to your *preface* of No. 1, Vol. III.

A member of the Agricultural Society in East Andover.

To the Recording Secretary, Boston.

January 28th, 1815.

EXTRACTS FROM "THE RURAL SOCRATES;" OR, AN ACCOUNT OF THE HUSBANDRY OF A PHILOSOPHICAL FARMER, LATELY LIVING IN SWITZERLAND.

[Hallowell, District of Maine. Edition 1800.]

Small farms, well cultivated, more profitable than large farms ill cultivated.

KLIYOGG thought that a small farm well cultivated, is more productive and more profitable than a large farm ill cultivated. He appears in this to have formed a just decision. A large landed property kept under cultivation, implies a large investment of capital in the soil, large taxes, large fences, and large ploughings; such a property is not easily travelled over by the proprietor, by his laborers, or by his teams; it is more difficult to inspect it from the farm house by the eye; more impracticable to protect it from robbery and inroads; it demands more attendants and more seed; when it becomes likewise the common system of others in the country, it will be found from the large size of each farm, that the market, the church, the neighbour, and the artisan's shop, must each in effect be thrown at a greater distance; roads also becoming longer, must thence be kept in worse repair; the country will be found less populous within the same extent; and negligent habits will too certainly prevail in every thing, which will in time seize even the moral character of the cultivator.

"Columella relates a story from Grœcinus in confirmation of this. A man had two daughters and a large vineyard, of which he gave a third part with the eldest daughter in marriage, and yet he gathered as much fruit as he did before. Afterwards he married the younger daughter, with another third for her portion, and still found that his remaining third part produced as much as the whole had done, which could arise from no other cause, than that he was able to cultivate a third part better than the whole vineyard before it was divided."

Oxen more profitable on a Farm than Horses.

Kliyogg finds his horse more expensive than serviceable, and seems determined to sell him, and lay out the money in oxen. A horse, he says, is a very expensive animal. He requires the same quantity of hay as an ox, besides oats and shoeing, to the amount of a pistole yearly. The value of a horse decreases with years; whereas an ox, when old and past labor, may be fattened and sold for his master's benefit. In a word, he computes that two oxen may be maintained for one horse;* and, it may be added, that horse-dung is by no means so beneficial to land, as the dung of horned cattle.

The advantages which Kliyogg derives from his cattle are, first, milk and butter, for family uses; secondly, work; thirdly, *manure.* He very rationally considers the last article (manure) as the basis of the improvement of the soil; consequently he has applied the whole force of his care and industry towards its accumulation, and has so well succeeded, that from his small number of beasts, he collects yearly about a hundred tumbrel loads.† This is double the quantity he gathered the first year of his farming, (which yet was equal to what had been done by any

* This determination of our cultivator is very remarkable, and should be attended to by all English farmers and others, who have an opportunity of making a choice between horses and oxen for the works of husbandry. This peasant attended to the minutiæ of the comparison with an accuracy unattainable in his superiors. He worked them, fed them, and performed every office relative to them, *himself.* How particularly judicious therefore must be his ideas of the matter! The proportion of *two* to *one* is a prodigious superiority, absolutely decisive. It is the discovery of a proportion that was greatly wanted in husbandry, and should be kept in memory as a point of knowledge.

† Tombereau.

husbandman in the village,) and led him to conclude, "that the generality of farmers have too great a proportion of live stock to their ground." This conclusion appeared to me at first very extraordinary, and almost tempted me to believe my philosopher a man of paradox and singularity. But his explication of this ænigma, satisfied and undeceived me. "When a farm," says he, "is overstocked, the farmer is forced to send his cows, in the summer months, to graze on commons at a distance from their sheds, which is the loss of so much to the farm-yard. The poverty of these commons reduces their milk, and to remedy this inconvenience, the manger must be filled with fresh grass when they are brought home at night, which necessarily occasions a diminution of winter stores. Scarcity of hay must imply a call for straw, which ought to have been entirely appropriated to the use of the dunghill, as without it no improvement of soil can be expected; besides which, bad food is the source of an infinite variety of distempers." In this manner the judicious Kliyogg pointed out a principal cause of the decline of agriculture in this country. It is a certain fact, that many of our farmers keep more cattle than they can conveniently support in winter. The arable and meadow lands are, by this bad management, deprived of part of the manure they require. The cattle being enfeebled for want of wholesome nourishment, particularly towards the spring, lose their milk or their laboring strength, and frequently die of diseases easily accounted for! These are melancholy truths hich experience too well evinces!

Our sagacious husbandman keeps no more live stock than he can amply support with grass and hay from his own fields. The straw is carefully preserved and used only for litter, of which he is so liberal in his stalls that the beasts are buried in it up to the knees *

Various modes of collecting and making Manures, with Remarks.

He is attentive also to gather all the dried leaves, moss, and rushes from the ground, that can serve for litter. The small dead boughs and pointed leaves of fir trees in particular, afford plentiful materials for this purpose; and he employs in this oc-

* A most excellent practice that cannot be too much admired. It is amazing, the quantity of manure that may be raised by such practices, when a man can command a plenty of litter. Y.

cupation the greater part of the time he can spare from his other work. A compost dunghill appears to him an object of so great importance to the improvement of land, that, of all branches of labour, he regrets the want of assistants in this the most; and waits, as a singular blessing, the time when his children shall be capable of contributing their share: so thoroughly is he persuaded that he wants only labouring hands to procure fifty loads more of manure, without increasing the number of his cattle.

In prosecution of this design in autumn, during the moon's increase, Kliyogg goes into his wood with a hedge-bill to prune the supernumerary branches of fir and pine trees, even of those which he thinks it useful to leave, boldly venturing to cut the lower shoots of young trees close to the trunk. These he binds into faggots and carries home, placing them under a shed till a proper season for prosecuting his work. At leisure hours, and especially in long winter evenings, he prepares these faggots for the purposes intended, an employment so little disagreeable or fatiguing, that it serves him for recreation. He begins with cutting the small boughs away from the larger ones, laying them with the pointed leaves of these trees in little heaps to be used for litter, while the larger and tougher boughs are reserved for fuel. By this method he amasses many proper materials for good manure, that are commonly suffered to rot uselessly in the woods, which is so much real loss to husbandry. To Kliyogg this discovery is an inestimable treasure, of which we were either ignorant or forgetful. The opinion is further verified in in Zellweguer's description of the mode of husbandry used in the canton of Appenzell. They scatter there dead branches of fir and pine-trees in great roads to be trampled by cattle and passengers, by which means they acquire a beginning of putrefaction, and are converted into manure though of a very indifferent quality. But Kliyogg, who had experienced how defective this method was, has succeeded in what at first seemed hard to accomplish; namely, converting these very materials into excellent manure. It is known that the resinous and aromatic juices contained in the prickly leaves of pines are powerful enemies to putrefaction; but what obstacles are not to be surmounted by reason, seconded by industry? Kliyogg subdued them all, by observing certain rules in the preparation of litter for his cattle, and of the different strata of his dunghill.

In regard to the first article, he seldom removes the litter under a week, strewing fresh upon the top once a day, by which means it becomes impregnated with animal salts, and acquires a very evident degree of fermentation before it is removed to the dunghill. An objection may arise to this practice, which I myself could not avoid making; namely, that the strong effluvia arising from the fermented litter, must be prejudicial to the health of the cattle. But Kliyogg assured me, that experience contradicted this; and thanked God that his beasts had always been remarkably healthful and vigorous. Nor does this method prevent cleanliness, if a constant supply of fresh litter is attended to, and the cattle are, at the same time, more warm and comfortable.

This exactness is equally conspicuous in the management of the litter when taken away. It is placed in separate layers upon the dunghill; so methodized that those where the fermentation is soonest to be expected, may accelerate the putrefaction of others where it is more slow. In the beginning of autumn he litters his cattle with straw during two months; the next two months he litters them with twigs and spines (or pointed leaves) from fir and pine trees; then straw again, or rushes and dried leaves; then twigs and spines, and so on alternately.

The regulation of his compost dunghill is as follows: Lest the fermentation should be totally suppressed or even checked by drought, he is assiduously attentive to the preservation of a certain degree of moisture The celebrated M. de Reaumur, in his Treatise on hatching eggs in ovens or hot-houses, observes, that when the heat of the hot-bed decreases, it should be watered to increase fermentation. The sagacity of our philosopher has explained to him, that to obtain a manure thoroughly rotten, he has nothing to do but to preserve a constant fermentation by frequent waterings. To facilitate this, he has sunk near his dunghill seven large square pits, which are planked with wood in the form of boxes. In these pits he keeps the prolific water, essential to so many operations. First, putting some thoroughly fermented cow-dung at the bottom of his wooden boxes, he pours in a pretty considerable quantity of boiling water, and then fills up the pit with fresh water from his wells; this brings on, in three weeks, a state of putrescence, which, without boiling water, could not be attainable in two months. He has thus a perpetual supply of corrupted water, as well for the purposes

of vegetation, as to keep his dunghill in a constant state of humidity.* But as the expense and labour of such a work might far exceed the profit, Kliyogg has thought of a means that, in a great measure, reduces both; this he calls, in his language, "going the shortest way to work," which is a fundamental maxim in all his proceedings. In pursuance of it, he dug a well in an orchard adjoining to his bleaching-ground, at a proper height, to convey whatever quantity of water he has occasion for, by a wooden pipe directly into the copper. His reservoirs of stagnant water are sunk below his stalls and stables, with the same view to conveniency. There is likewise a trough at the declivity of the dunghill to receive the water that drains from it, which gives an easy opportunity of moistening the dunghill frequently, without robbing the soil of its share of the stagnant water.

The success of this method of watering his dunghill, suggested an idea of putrefying small twigs of fir or pine, without using them for litter. He lays them in close heaps, pressed down, and covered with earth, to prevent evaporation; and pours stagnated water on them every day, till converted into rich mould.

* Were the encouragers of agriculture to compare what is here related with part 11, section 5, of that incomparable work of Dr. Francis Home's, entitled *the Principles of Agriculture and Vegetation*, they would certainly be struck with the exact similarity that appears in the practical husbandry of our judicious peasant, and the Doctor's precepts given as new observations. Kliyogg discovered them by the light of nature; Home, by his knowledge in chemistry! "Let us make," says he, page 61, "some practical observations with regard to the management of dunghills; for this is an affair of considerable importance, and in which farmers seem to be very ignorant. Dry vegetables require a considerable degree of moisture before they can be brought to putrefy. I think dunghills are generally kept too dry, as they are commonly placed on a high situation, and are themselves raised to a considerable height. A hollow situation, which will retain the moisture, is the best. Too much moisture is likewise bad. This may be prevented by having hollow places with clay bottoms at the side of the dunghill, into which the superfluous moisture may be allowed to run, and from whence it may be restored again by pumps to the dunghill at pleasure."—And again, "there are ferments for the putrefactive fermentation as well as the vinous." If the urine of horses and stall-fed cattle is carried into proper reservoirs, and there allowed to turn stale, it will, if thrown on the dunghill, very much quicken the fermentation. F.

Kliyogg is so perfectly convinced of the efficacy of heat in accelerating putrefaction, that he believes all soils, even the most barren, may be rendered fertile by warmth. Upon this principle he infers, that an *extremely hot dry* summer will be succeeded by a remarkably fruitful one. "Heat," says Kliyogg, "putrefies and enriches."* In consequence of this opinion he told me, about the middle of the winter 1759, that the ensuing harvest would yield three sheaves instead of two: the event confirmed the prediction. He repeated the same thing immediately after the drought of last year, which is verified in the present year of plenty, 1761. It will even appear that the earth has been more lavish in her productions this year than the pre-

* We shall be sensible of the truth of this observation of our judicious peasant, if we extend our reflections to those countries where the climate, without being excessively hot, is yet much warmer than our own; and where we shall find a much more vigorous vegetation, than can be accounted for from difference of soil or labour. Herodotus assures us that the lands of Babylon produced from two to three hundred ears of corn for one. Pliny says, that in Lybia, the proportion was one hundred and fifty: Chili produces from sixty to eighty and a hundred. The fertility in particular districts of Peru, is still greater; there are fields where the reapers gather four or five hundred for one, of all kinds of grain. Mr. Adamson, an ingenious naturalist, attributes the extraordinary fruitfulness of the sands of Senegal to the effects of *heat*. He informs us, that he sowed several sorts of leguminous seeds, which afforded twelve crops in a year. The never failing harvests of Sicily, Egypt, and part of northern Africa, are well known; as well as the ancient fertility of Corsica and Spain. Let us recollect the former fertility and population of the Holy Land. Let us cast a look towards China and some particular provinces of India and Persia—and we shall be convinced at least, that all things considered, there cannot be so great a proportion of manure, or of indefatigable labouring hands in those countries, as in our own F.

Thus far the French translator But it is not the hot summer in Switzerland which is fruitful; it is the succeeding one. A *fallow* occurs during the heat, which favors the succeeding crops; but is at the expense of the first crop.

The prolific vegetation of certain hot countries is owing to great and long heats, joined to a moist soil or air. *Long continued* growing weather is equivalent to two or three summers in the course of one and the same year; and therefore gives room for successive crops in the same year. For the same reason *inferior* soils in hot countries, if seconded by moisture, yield more in a given crop, than they do in the colder climates of the north. E.

ceding, if allowances are made for the north winds, which prevailed in the beginning of April.

Our indefatigable cultivator does not bound his improvements within the circle of that quantity of manure, which his industry procures from a small number of cattle. He buys every year seven tumbrel loads of dung from his neighbours, which cost him 1*£*. 10*s*. 7*d*. These he mixes with six tons of peat ashes, which come to about two shillings the twenty bushels. He finds the effect of these two kinds of manure answerable to the price.

Not satisfied with this, he turned his attention to other methods of enriching his land. With this view he took a journey into the bailiwick of Regensperg, where they use marle with great success; it being found in abundance below Laguerberg. Having made strict inquiries into its properties and the manner of using it, this species of improvement appeared to him so desirable, that at his return he made many unsuccessful attempts to discover marle in his own neighbourhood. What a pity that this examiner of nature should be a stranger to the use of the *boring instrument* in these inquiries! As a substitute for marle, his industry discovered a method of improving land that answered very near the same purposes, from a small *gravel;* of which I shall give a circumstantial detail when I describe Kliyogg's manner of preparing his land for corn. He likewise found in turf, cut from the surface of the pasture or fallow land where the grass is very luxuriant, proper materials, when well prepared, for rich manure. The preparation consists in exposing the turf for two years in open air, to all the influence of the seasons, till it is entirely decayed; when it may be spread with success on meadows or corn fields. Kliyogg never suffers prejudice of any kind to lead him to the rejection of new experiments, but thinks them all deserving of attention, and testifies his gratitude to the communicator. He apprehends, in general, that *all mixture of earths, where their nature is different*, contributes to fertility; nay, even where the distinction lies only in colour; and he has no doubt of improving a field, if at a moderate expense, he can contrive to carry fresh mould to it of a different quality. Thus a light soil, according to him, is improved by a heavy one; a sandy soil by a clayey one; a blue clay by a red clay, &c.

It is in these different modes of procuring manure, and in the continual pains to obtain it, that in the opinion of our judicious cultivator, the fundamental basis of agriculture consists. In truth, lands are more improved, and with less trouble, by proper manure, than by frequent ploughing or digging;* notwithstanding Tull, an English writer, attempts to prove the sufficiency of the latter alone. Let it be granted to Tull, that manure has no other effect than to heat and render the earth more porous, from a fermentation excited. Is not not this effect more likely to be produced from the facility with which it penetrates according to its nature, the smallest particles of earth when in contact with them; than from a simple division of these particles by an operation merely mechanical? It may likewise be added, that the oily and saline parts contained in manure are extremely conducive to the nourishment of plants: nor is it less certain than an union of these two methods of improvement, is the ultimate perfection of husbandry. It would be for the advantage of every farmer, if he had leisure, to plough his lands according to the rules laid down by Tull and his imitators, after having first well dressed them with proper manure.†

* Those parts of rural economics which have divided the opinion of the superior class of cultivators, will by them be very seldom determined Their ingenuity is too great to admit of entire conviction. The unprejudiced part of the world should in such cases, be determined by opinions totally unbiassed by *systems* Kliyogg's testimony in this affair coincides with that of the best husbandmen from the beginning of the world to this day; and I have found it true from the proof of some hundreds of particular experiments on both gravelly and clayey loams. Y.

† "Frederick William, king of Prussia, an excellent financier in many respects, and who applied many great ideas to the detail of practice, reasoned very justly in making it an established principle of his political system, that *agriculture is the foundation of the opulence and prosperity of a state.* He encouraged it in the strongest manner, and made regulations in its favour, of which the wisdom was unperceived till after many years. The constant attention he paid to the observance of these regulations completed their salutary effects. This monarch had understanding to know (and all financiers ought to be proud of receiving instructions from a master) that the most stubborn and infertile soils are meliorated by manuring and ploughing; and that rich lands are made still richer. He therefore insisted that the farmers of his demesnes, and the proprietors of estates in lands, should manure them sufficiently, and plough them deeply and frequently. *When the king was expected to pass through*

On the advantage of flowing Meadow Lands, with Remarks.

Laying meadow under water, furnishes a *second* means of improving the soil so extremely advantageous, that the difference is very immaterial between the crops of a meadow well watered or well manured.* This, indeed, greatly depends on the properties of the water, and the method of conducting it over the ground. Spring water is, in Kliyogg's opinion, the best; especially when it can be procured immediately from the spring; for he observes that it insensibly decreases in virtue, in proportion to the distance.

I confess that I could assign no satisfactory reason† for such a diminution, but did not think myself authorized to dispute the

any of the provinces, the gentlemen, the farmers, nay even the peasants, thought they could not pay their court better, than in placing a large dunghill before their doors. A powdered courtier might sneeringly deny to this economical attention a place amongst the royal virtues; but the sagacious monarch was sensible, that these dunghills spread over the fields would produce a crop of ducats. He accordingly had the satisfaction to see, after reigning some years, the sands of the Marche of Brandenburg, and the heaths and morasses of Prussia, covered with a plentiful harvest of the finest grain in the world. The king, his son, supplied all that was wanting to bring this noble plan to perfection; and we have seen in a very short space of time, the sandy desart, that extended to the very gates of Berlin, converted into excellent land by a kind of economical enchantment." (Political Institutes, by Baron Bielfeld. Vol. 1, p. 181.)

This monarch in the year 1727, founded in the university of Halle, the first professorship of Rural Economy which had been seen in Europe; and the example has since been happily copied in many other universities of Germany. F.

* This is a part of husbandry strangely neglected in England, but of undoubted importance. I experienced it in my Suffolk farm, and yet stronger in my present Herfordshire one; where any person that will call on me, may see the vast difference between a meadow in the parts watered and unwatered. I had this year (1769) as much hay from off one watered acre, as all the other four unwatered ones in the same field. Y.

† The difficulty is not perhaps so great as may be imagined, to support this observation of Kliyogg's by philosophical reasoning. A deep spring preserves near its source, a temperature nearly the same in all seasons. From eight to ten degrees above freezing, is, according to *Reaumur's* thermometer, the greatest variation. But a stream, whose surface considerably exceeds its depth, will acquire, during the summer solstice, an increase of heat in proportion to its distance from its source. When

truth of his observation; having, on all other occasions, found in him those qualities necessary to form the accurate observer; namely, a facility in embracing luminous views of a subject, joined to a persevering attention and an entire freedom from prejudice.

He finds that water from mossy grounds is very injurious to grass, and destroys it entirely. Water loaded with calcarious grit stone, may likewise be of the worst consequence to a meadow; so that the husbandman cannot attend too carefully to his water, otherwise his lands may suffer more from overflowing than from drought Nothing ascertains the salubrity of water more than the production of cresses, brookline, and succulent

this is too great, it has been proved, that far from refreshing the grass, it turns it yellow and injures it in many respects. It is also customary in some countries to overflow meadow land in winter, especially towards the spring; when the water gradually melts the ice that may have lodged; for if this operation were left to the action of the sun, the effects would be too precipitate, and prove highly pernicious to the young blades of grass. One may naturally conclude, that the water best calculated for enriching a soil, has that degree of temperature already said to be inherent in water, near its source; and that a stream which from the length of its course has considerably augmented its original heat or cold, according to the season, must be more hurtful than beneficial. It is also to be remarked, that water taken near to its source preserves its original purity; while that which passes over different lands, may be impregnated in its course with particles of tufo, (or calcarious grit-stone) or contract a chalybeat or other vicious quality, which may render it injurious to the meadow over which it is to be spread. On the other hand, there may be instances of water being found pernicious to adjacent meadows, but salubrious to those more remotely situated; owing to noxious particles, which it may deposit in the beds of sand or gravel over which it runs, thus at length becoming purified. But it does not seem advisable to overflow any land with spring water either during the excessive heat of summer, or the intense cold of winter. Excellent remarks on the watering of land are to be met with in a memorial which carried the prize given by the Ecoonomical Society of Berne, inserted in their Journal, Vol. II. (sold at Zurich, by Heideggner and Company, and at Paris, by Brocas and Humbolt of St. Jaques Street). F.

The annotator here, in speaking of the temperature of springs, forgets that this temperature varies in different climates, elevations, and exposures; corresponding, with considerable exactness, to the average effects of the sun's heat through the year in the place where the spring is found. E.

plants. But when a river is choaked with rushes,* spear-wort, or moss, its water will be destructive to vegetation.

The rules necessary to be observed in sluicing of lands, are, according to Kliyogg, to take particular care that the principal and dependent channels, be placed in a proper situation to distribute the water over as much of the meadow as possible. The direction of the principal trench ought to run across the most elevated part of the ground, in order to give a due inclination to the collateral branches; nor should it be cut too deep, which would prevent the inundation from being gradually extended over the whole surface. It is likewise essentially necessary to slope the trenches in such a manner, that the water may be carried off with facility, and no part remain stagnant, which would immediately occasion putrefaction; for the turf being once injured, the meadow would soon become swampy and the grass bad. It will also be necessary to change the trenches frequently, filling up those first made, so that every part of the land may reap, in turn, benefit from this operation. Our cultivator considerably augments the vegetative properties of the water by mould, procured, as I have already mentioned, from green turf cut from eminences in pasture or fallow land. This he throws into the principal head of water, so that the lesser channels may imbibe and communicate fertility over the meadow.†

Cattle not to be allowed to graze on meadow land late in the year.

The autumnal grass, which Kliyogg converts into manure, supplies him with a *third method* of improving his meadow; for he thinks it very hurtful to the ground to suffer cattle to

* This is occasioned by the seeds of mosses and rushes, which the water spreads in its course. Those of moss soon rise and multiply exceedingly, covering the surface of the ground and entangling the fibres of the herbage and grass, till they are stifled, without supplying any nourishing food in their room, for moss never rises high enough to be touched with a scythe; or, if hay could be made of it, the cattle would not eat it. To obviate this misfortune, cinders and ashes may be strewed, which will kill all kinds of moss. And rushes may be extirpated if they are carefully drawn out by the roots, and the ground drained that produces them. F.

† This is a good thought; but the benefit, on some soils, of casting *unslacked* lime into the stream would be much greater, and acquired at a much less expense. Y.

graze late in the year.* Independently of the loss of so much manure, the beasts break the turf; and in a rainy season, which commonly happens in autumn, the impression of their feet forms so many cells for the water, and this water congealing in winter, greatly injures the roots of the grass. This is a new proof of the bad husbandry of maintaining a disproportionate number of horned cattle, which occasions the farmer to let them devour every blade of grass for their support, and run the hazard of robbing the earth of its best substance, till by degrees the farm is entirely ruined.

Kliyogg is not satisfied with the improvement of his meadows, but seeks to extend them; without however deviating from his grand principle, never to purchase more ground, till he has carried the culture of what he possesses to the highest degree of perfection it is capable of attaining.† How is it possible, says he, if a cultivator has not been able to cultivate properly what he already possesses, that he should be able to do it, if, by increasing his possessions, he still more overloads himself with care and work?

The fertility of an estate is always in proportion to the culture bestowed; nay, it will even be found, that if a man doubles his number of acres, and employs only the same number of labouring hands as when he had only half the number, that his estate will clear less than it did before the additional purchase. Thus it is evident, that a farmer may have too much ground, as well as too much live stock. For our conviction, nothing more is required than to take a survey of an overgrown farm badly occupied; where lands, with every advantage of situation, will not produce more than a fourth part of what lands of the same quantity and quality afford, divided into equal allotments, amongst the inhabitants of a populous village.

* This is most excellent advice; but through vast tracts of country in England, they suffer their cattle to remain in the fields all winter, and even feed with hay in the pastures. There cannot be a more execrable system of conduct. Y.

† I cannot read this work without expressing my surprise that a book which certainly contains many ideas of culture, equal, at least, to any that have been offered to the public, should have remained so long unknown in England. The most refined experience could not start a juster observation; it is a lesson to all the farmers of every country in the world.

Great crops of Grass and the coming in of profitable species of Grass, depends more on manuring well than on the choice of seed.

He is not very anxious in the choice of seed; for experience has taught him, that the difference of herbage depends entirely on the nature of the soil and the preparation of the ground. The same meadow that is matted with moss and every kind of unprofitable beggarly weeds, will produce trefoil of the best quality when improved by manure, adapted to its nature.* In this instance, we find a manifest proof of the infinite wisdom and goodness of the Creator. Let but the husbandman fulfil his part of the obligation by industrious culture, and leave the result to Providence. The most wholesome and nutricious plants will grow spontaneously; the winds will waft from distant fields the most useful seeds, which want nothing but a proper bed to make them vegetate, whilst noxious weeds, not finding suitable nourishment, will wither for want of the juices appropriated for them.

* Kliyogg, in this remark, displays his real experience. I have often made the same observation, but it should be limited; for if the nature of *perennial* plants be bad, manuring will improve their luxuriance as well as that of the best vegetables. The following instance, mentioned by that excellent cultivator, Sir Digby Legard, is a very strong proof "I have often observed fields covered with white clover, where pasture has preceded arable land, without any person's remembering the sowing of it; and often, in an old worn-out meadow or pasture, a crop of this will appear after plentiful dunging. This fact of the white clover springing in great quantities on land, copiously manured, where there was before such manuring no appearance of it, is very curious; but frequent in northern parts of England and in Scotland It is not confined to manuring with dung; but the same event follows, where a change of soil is made by lime or marle, laid on in great quantities. I have an account by me of an uncommon large crop, no less than three tons an acre being produced at Kedgely-Moor, in Northumberland, in consequence of a large quantity of lime being laid on some acres of black moor land covered with heath; the heath was entirely killed, and this great burthen of white clover succeeded, without any assignable means of conveyance of the seed. I find from other accounts, that the same commonly happens in the county of Galloway, where great quantities of such moor land have been lately brought into cultivation. Very copious manuring with lime, dung and marle, appears there to destroy the heath, and produce white clover."—*Memoirs of Agriculture*, Vol I, page 366. Y.

Till lately, Kliyogg never heard of artificial grasses. The first account of them engaged his attention. The Philosophical Society of Zurich remitted him some pounds of Flanders trefoil seed (*trifolium pratense purpureum majus. Ray. Hist.* 944) requesting him to make some experiments. For this purpose he prepared a piece of ground near his house, in the manner I have described, and divided it into two equal parts; in one he sowed the Flanders trefoil; in the other, common grass seeds. Both divisions were manured in the same manner and carefully watered from the stagnant pools; and he accurately observed the comparative produce. In waiting the result, he made several other trials of the Flanders trefoil in smaller spots of ground, some richly manured, others of the same size in an unimproved state. These various experiments tended to convince him that this foreign trefoil, like the grasses common to our own country, was more or less luxuriant, chiefly according as the soil was more or less manured. In regard to the grand experiment to find the difference of produce from the seed of trefoil and that of common grass, in ground where the culture and preparation are the same, Kliyogg declares he cannot discern any that is material. It is much to be wished that sensible and unprejudiced farmers would take equal pains in making experiments on lucerne, saint-foin, and other species of exotic grasses, whose excellencies are so highly extolled in the present age; as by a calculation of their just advantages over our natural herbage, we should be able to determine whether the substitution of them would answer. Some enlightened friends of agriculture have already informed me, that the trials they have hitherto made, fail short of the desired success; and that they find it much more profitable to continue the old method of husbandry, than to use these articles of modern discovery; for instance, the Flanders trefoil, which, in supplying a very succulent nutrition, excites cattle to feed immoderately, and occasions very alarming distempers.*

* I should imagine the only thing wanting to prevent this inconvenience, is a due regulation of the quantity of trefoil which a beast may eat without hazard, and which never ought to be exceeded. A proportion not difficult to ascertain, with the assistance of a little attention and experience. The invaluable *Collections of Observations by the Agricultural Society in Britanny*, recommends, in several places, what to me appears an excellent method. "It had been remarked by the Baron de Pontual, that to fodder cattle with

Kliyogg made me attend to a circumstance which may prove the destruction of a meadow if not corrected. This is when the plantane is suffered to predominate; whose large leaves so totally cover the surface of the ground, that no other herbage can spring up.* He pointed to my observation a meadow, where the plantane was spread over the soil and reduced it to sterility. The sole remedy for this evil, in his opinion, is to plough up the meadow and sow it with grain for some years, and afterwards, in the manner already described, it may be converted into meadow again.

Importance of varying the Seed on the same ground.

Kliyogg likewise observes, that whoever is desirous of constantly plentiful crops, should be sensible how very essential it is frequently to vary the seed upon the same ground. Thus he is indefatigable in the search of new; and is so thoroughly convinced of the utility of this rule, that he affirms that there is an advantageous difference in the produce, if he buy seed at a village only four leagues distant from his own. This remark is worthy the attention of some curious naturalist.

trefoil only, heated them too much. A native of Flanders taught him to temper this heat by a very useful piece of economy Amongst the Flemings where the meadows abound with this grass, they make layers in their hay-lofts six or seven inches deep, of straw and trefoil alternately The straw imbibes the scent of the trefoil so strongly, that oxen and horses eat both, with equal avidity. By this means the value of straw becomes equivalent to that of trefoil, and the cattle are preserved sleek and cool"

There is great probability likewise that Kliyogg was unacquainted with the best method for the culture of trefoil. The same *Observations* inform us, "That it succeeded very well when sowed with oats, which is the last crop in rotation before the ground is suffered to lie fallow. President de Montluc, who began to make experiments in 1758, has had remarkably fine crops of oats. At the time they were ripe. the trefoil was in great luxuriancy below, about two feet in height. The manure still remaining in the ground after the first crops are mowed, and the ploughing necessary for the oats are equally beneficial to the trefoil. Experience has convinced him, that with only the additional price of seed, a man may have, for several successive seasons, a rich meadow of trefoil, which may be mowed in most years twice, and in favourable ones three and four times." F.

* This is precisely the case in England; but the narrow leaved plantane, called in the north rib-grass, is an excellent pasture. Y.

Gravel, on some soils, a very valuable manure.

Our industrious laborer bestows on his arable lands a kind of manure, whose effects appeared singularly astonishing to me, when he took me into one of his inclosures a little before harvest. A third part of this field, from a deficiency of hands and leisure that year, had been without this manure. I instantly perceived, though little accustomed to these minute observations, a very sensible difference between that part of the field which had been manured, and the other. Kliyogg computed this difference to be one third loss in the crop. The manure he made use of, was a small gravel of a bluish hue, and bordering upon marle; the soil on which it was spread being a greasy, reddish sand. Kliyogg discovered veins of this gravel running along the sides of some barren uncultivated hills in the neighbourhood, commonly on the superficies, or a very few feet below it. In loading his carts, he throws aside the larger stones, strewing only the fine part on light lands. This is one of his occupations on winter days, which the generality of husbandmen devote to indolence, or at least to domestic engagements of small advantage. The deep snow that covers the ground during great part of the winter season, greatly facilitates his work by the use of sledges, and considerably lessens the fatigue of the oxen. I saw him last winter in high delight at the appearance of a settled frost, which gave him hopes of a good road for sledges for some weeks. There seems a great analogy between the operation of this gravel and that ascribed to marle, if it is not indeed the production of the marle itself, which is discoverable among the small particles of gravel. Kliyogg apprehends the salutary effects of this species of manure to arise from the heat communicated to the earth; he also attributes to it the virtue of extirpating baneful herbs, and particularly a kind of *pædiculaire* (*rhinanthus christa galli, Linn.*) a plant so destructive to barley, that when it gets the mastery in a field, there is little to be reaped.

By the assistance of this manure, Kliyogg has converted the worst land imaginable into excellent grain fields. He lately bought near an acre of sterile ground for 4l. 14s. 6d. and hopes to make it worth 21l. 17s. 6d. within a few years, a thing by no means improbable, as he has already given specimens of equal improvement, on soils that had been given up from their barrenness or distant situation. Alterations so astonishing prove, in a

forcible manner, how much foundation there is for his assertion, that we ought to attribute it to the laziness and unskilfulness of the peasants, if our country does not produce even a superfluity of grain!

Dressing lands with this manure is not a new discovery; the negligence of the peasants seems the reason why it is not more practised. These allege, by way of justification, that they will not pretend to dispute its efficacy for a few years; but that after a certain term, the ground will be as much, or rather more impoverished than it was originally. We freely, in reply, grant the operation of this manure to be limited to such a period, when it ought to be renewed, or some other to be substituted in its place; but is not this the case with every improvement in husbandry? It is only as the reward of constant and diligent labour, that the earth yields her treasures to man. Kliyogg supports all his arguments on this principle, which has never deceived him. The fortunate success with which heaven has blessed his industry, encourages him, with assiduous application, to invent new operations, rationally deduced from new experiments in agriculture. The effects of gravel led him to this general maxim, *that every species of earth may be instrumental to the improvement of another of opposite qualities.* The discovery, therefore, of a stratum of earth hitherto unknown to him, is as great an acquisition in his eyes, as a purse of gold in those of a miser.

Method of Reclaiming Wet Lands.

Kliyogg has another peculiarity in the culture of his arable land Disapproving the custom of throwing it into ridges to prevent wetness, which not only wastes much land, but occasions the roots of the grain on the sides of the ridges to be overflowed as they lie in the furrows between; he thus remedied the double injury. He changed these furrows into trenches of the depth of about two feet, which he half-filled with large stones, and then covered with pine branches, spreading the earth taken out of the trenches over the whole. In this manner he regained so much lost land, and obtained from it as good grain as from the rest of the field.* By a process nearly re-

* This is the famous method of draining all sorts of wet soils in England. I do not remember meeting before with any mention of it in the French authors. It is very extraordinary that this peasant, enlighten d only by nature, should unite in his little farm, so many of the best practices of European husbandry! Y.

sembling this, he has made a very fine hemp field of a piece of ground situated in a sloping bottom, on the side of a great road, which, after heavy rains, was constantly overflowed by torrents coming from the road, and had been given up as unprofitable.

The cultivation, by farmers, of abundant crops of Garden Vegetables for Family Use, good economy.

Our wise cultivator has appropriated a pretty large enclosure to the culture of *vegetables*, such as French beans, pease, cabbages, &c. These suffice for the maintenance of his family during the greater part of summer, a branch of economy that distinguishes him from the peasants of that country, who, excepting the beet, cultivate very little vegetable food, which obliges them to consume a much greater quantity of bread and flour, and diminishes in proportion the only means they have of procuring money, so necessary to pursue their improvements. His children are entrusted with his kitchen garden; an easy task, adapted to their strength and which trains them gradually to the performance of more toilsome work.

Potatoes more profitable than any other kind of Crop.

I ought not to omit his rules for the culture of *potatoes*, as he is the first man in the village who has made them an essential object of attention; the other peasants being satisfied with having some beds of them in their gardens.* The excellent properties of potatoes and their great utility, have given them, in the opinion of Kliyogg, a very decisive preference over all other fruits of the earth. One acre produces two hundred bushels. The daily consumption in his family is one bushel. He computes that the comparative value of an acre of potatoes to an acre of wheat, is, as ten to six; a very essential difference! We may likewise add, that this root remains in security under ground, free from those dangers to which plants and grains are exposed from the variations of seasons. Neither the nipping frosts in spring, nor snow, nor hail, which so frequently disappoint and destroy the labours of the husbandman, can injure the growth of potatoes. In promoting their culture we find a new resource against national alarms, and a well-grounded hope that

* The culture of potatoes is in a manner recent, and this part of the Rural Socrates was written half a century ago. What appears, therefore, either mistaken or common in the text, must be excused. E.

better rural economy may, by degrees, release us from that dependance on our neighbours, the unavoidable consequence of our present situation. Let the culture of potatoes once become general, the industrious peasant will procure, from a very small piece of ground, a comfortable subsistence for his family; nor will he be liable to disappointment even in the most unfriendly years. He will cultivate, within a trifle, the same quantity of arable land, and will be able to carry to market the profits of his harvest almost entire, whilst before this discovery, he expended a very considerable part in his household. This advantage is so manifest, that the culture of potatoes is already common in many districts of Switzerland, particularly in those whose vicinity to the Alps exposes them most to the inclemency of winter. I apprehend it will not be thought an useless process, if we enter into a circumstantial detail of Kliyogg's husbandry in this essential branch.

When he has selected a proper spot of ground, it is prepared in autumn by ploughing, after first spreading over it some tumbrels of marley gravel, especially if the soil is subject to weeds. Towards the following spring, he lays ten loads of manure on an acre, and ploughs a second time. He then sets the potatoes in the furrows, two or three together, leaving a foot's space betwixt. The very large ones may be cut in pieces. His allowance is ten bushels an acre. Thus planted, the field is covered again with manure, and left in that state fifteen days,* when it is harrowed over. A dry season is judged best for planting, as it is more likely to kill the weeds which are dislodged; for the success of potatoes chiefly depends on the assiduity of the husbandman in cleaning the ground. For this reason, great attention is required when the leaves of the potatoes shoot half a foot above the surface, to have it carefully weeded. When this is done, Kliyogg waters them from his pools. If a fresh crop of noxious plants arises, a second, and often a third weeding is bestowed. In the autumn, about a fortnight after seed-time, the potatoes are drawn out of the ground. He begins to gather in his harvest by cutting the tops close to the ground; if this can be done a month sooner it answers much better, he thinks,

* This operation is probably designed to prevent the starting of weeds. E.

by supplying the cattle with wholesome and well tasted forage.* The ground is then stirred with a pitch-fork to loosen the potatoes, which are gathered in baskets, and carried home in sacks.

ESSAY ON THE EXPRESSING OF OIL FROM SUN-FLOWER SEED, &c.

BY DR. J. MORGAN.

[Transactions of the American Philosophical Society.]

The grinding of the sun-flower seed and expressing oil from the same, is a manufacture, which, as far as can be yet learned, was first begun among the Moravian brethren at Bethlehem, and may be found useful as a substitute for olive oil in its various uses.

From experiments made at Bethlehem, it is found that a bushel of the sun-flower seed will yield near a gallon of mild oil.

Our correspondent at Lancaster, informs the society, that some persons in the neighbourhood of that place have also expressed a quantity of oil from the seeds of the sun-flower. His account is as follows.

"The person, who has raised the greatest quantity of the sun-flowers with us, informs me, that one hundred plants, set about three feet distant from each other, in the same manner Indian corn is commonly planted, will produce one bushel of seed, without any other trouble than that of putting the seed into the ground, from which he thinks one gallon of oil may be made. As the sun-flower is a plant of great increase, and requires much nourishment, hilling does not seem so good a method as that of setting the seed or plant in a hole, and when the plant is about a yard high, to throw in the mould round the stalk so that the surface of the ground may be even about it. By an estimate made, it appears that one acre of land will yield to the planter between forty and fifty bushels of seed, which will produce as many gallons of oil.

* However wholesome it may be, it is by no means well tasted; and I know from experience, that cattle, while they are supplied with the common sorts of food, will not touch them. Y. Horned cattle devour them in the northern parts of the United States. E.

The process of obtaining the oil from the sun-flower seed, as well as from the seeds of other plants, and from walnuts, filberts, &c. is as follows. The seeds are first rubbed to powder, or ground in a mill. They are then put into a strong bag made of canvass or woollen cloth, and committed to a press between iron plates, by which the oil is squeezed out, and is received or conducted into a proper vessel to collect it. The plates of the press are often heated, either in boiling water or before the fire. Many heat the mash itself in a large iron pot, stirring it about with a stick or piece of wood, to prevent its burning, which, when it happens, greatly injures the oil, and gives it a burnt smell and taste, or disposes it to become rancid in a short time. When the oil is drawn without the assistance of heat, it is known by the name of cold drawn oil, and is more valuable than when heat is used, but it is not obtained in the same quantity. It is milder and may be kept longer without spoiling.

In a cold season of the year a certain degree of heat is absolutely necessary. But if the oil be designed for aliment or medicine, the plates of the press should be heated in boiling water only. When the oil is intended for other uses, the plates may be made hotter, as heat expedites the separation of the oil, and gives a greater produce.

Sometimes the matter, when ground, appears almost like a dry powder. It is then said to be meager, and requires to be exposed to the vapours of boiling water, which is done either by tying it up in a bag or putting it into a sieve, and placing it over the steam. By this impregnation it will yield it's oil more readily, and in greater quantity. The oil may easily be freed from any water that may happen to be pressed with it, as a spontaneous separation between them will take place on standing for some time.

It may be observed that all the oils from whatever vegetable substances they are drawn, when obtained by expression with due caution, agree in their general qualities, and are constantly mild, even though they are obtained from very acrid substances. Thus the expressed oil of mustard seed is, when fresh, as mild as that of olives, and the bitter almond or peach kernel, affords an oil by expression as mild as that of sweet almonds; so that sun-flower oil may prove equally valuable with the best Florence oil for diet or medicine. For every expressed oil, when pure

and fresh, is void of acrimony, and free from any particular taste or smell.

Besides the mild oil just mentioned, some substances contain another kind of oil, called its essential oil, a part of which may be drawn off with the mild expressed oil, so called, and impart its smell or taste to that oil. It is called essential oil, from its yielding the particular odour of the vegetable or part of the plant from which it was obtained, it is pungent to the taste and soluble in spirits of wine, which the other is not.

The oil of sweet almonds and the oil of olives being pure unctuous expressed oils, not soluble in spirits of wine, but mild to the taste, and void of odour, very soft, emolient and lenitive, are chiefly used in medicine and diet. Perhaps on trial the sun-flower seeds will be found to contain an oil, that will answer the like good purposes with the sallad and medicinal oil now in use. The practicableness of procuring a native oil at a moderate expense, and the importance of using it fresh, together with the probable uses of sun-flower oil for varnishes, for the basis of ointments, and for mixing of paints, as well as other purposes to which oils may be applied, claim our attention to this subject.

INTELLIGENCE.

The Society's premium of $50 has been adjudged to Mr. Eli Cooley, of *Deerfield*, "for the best breed of swine, ~~that will afford the greatest weight.~~"

"I fattened," he says, "eight hogs, which weighed as follows, at nineteen months old—

One	577 pounds.
One	492 do.
One	520 do.
One	423 do.
One	492 do.
One	445 do.

The above was the weight in market.

One	405 do.
One	455 do.

The two last were put up for family use.

The above mentioned hogs were from a male brought from Roxbury, Massachusetts, and which is here known by the Stebbins' breed, and a sixth part Russia.

They were a litter of July, 1313, and nothing unusual occurred in the care of them, until the time of making cider; during this time they ran with the dam in the cider yard, and eat the pomace. the next winter, they were confined and fed mostly on raw potatoes. The succeeding spring gave them some provender, (a mixture of corn and oats,) until the grass and weeds had grown, then fed them on that and weeds, and gave for drink, the wash of the house, with but a very little provender in it. When pumpkins had arrived at maturity, fed them for about fifteen or twenty days on them boiled, then fed them on boiled potatoes, until the first of December, 1814, mixed with some provender. Then fed them with as much provender (half corn and half oats) as they would eat, and corn on the ear, until fifteen or twenty days before they were killed; after which time, I increased the quantity of corn in the provender. From the first of December, 1814,

to the twenty-fourth of February succeeding, I gave them about six quarts of provender each in a day. Almost daily, summer and winter, gave them fresh air in the sty. In cold weather made their swill about milk warm. All of the above hogs were very thick set and small bone, with very small ears and slim tails. I have taken much care in crossing the breed, and in obtaining a due proportion of those breeds I esteemed the best. The eight weighed before starting for market 3861 pounds; and six, in market, 2949 pounds, and were sold for $13\frac{5}{8}$ cents per pound. They were killed on the twenty-fourth of February, 1815."

THE Society's premium for the best machine for cutting straw, hay, and corn-stalks for cattle, has been adjudged to Elihu Hotchkiss, of Brattleborough, Vermont. A description of this machine, with an engraving, will be given in No. 1. of our next volume.

Catalogue of Approved Works on Agriculture in its Various Branches.

AGRICULTURA de Crescenzio, 4to. Printed 1478, Florence, or Pietro Crescentio d'Agricoltura, 8vo. Printed 1542, Venice.

"A new orchard and garden; by William Lawson. Edition 1648 or 1660. Printed with Markham's 4to 'Way to Get Wealth,' otherwise entitled "A new orchard, &c. or "The best way for planting, grafting, &c. with the country house wife's garden for herbs of common use; their virtues, &c. Also, Husbandry of Bees, &c.

A Garden of all sorts of Pleasant Flowers, &c. or Paradisi in Sole Paradisus Terrestris. Collected by John Parkinson, apothecary of London; 1629, folio. Printed by H. Lownes and Robert Young—612 pages with 109 wood cuts of flowers and fruits.

An Essay on Timber Trees; by Joseph Hall, 1645.

English Improver Improved, 4to; by Walter Blith. Printed in 1653—third edition.

Evelyn's Silva or a Discourse on Forest Trees, in two books. Fifth edition 1776 with notes by Alexander Hunter, M. D. Printed at York.

Systema Agriculturæ; the Mystery of Husbandry Discovered; By John Worlidge, gent. Fourth edition 1687, folio. London, printed by Thomas Dring. Pages 326.

New Improvements of Planting and Gardening; by Richard Bradley, Fellow of the Royal Society. Sixth edition, pages 608, 8vo. 1731.

A General Treatise of Husbandry and Gendening; by Richard Bradley, in four volumes 8vo. 1726, or the edition of 1766.

The Gentleman and Farmer's Guide in regard to Cattle, with cuts, 1729—8vo.

New Horse-Hoeing Husbandry, or an Essay on the Principles of Tillage and Vegetation; by Jethro Tull, 8vo. Edition, 1762.

An Account of a Threshing Machine, invented at Dalkeith, in Scotland, which in a minute gives 1320 strokes, as many as thirty-three men—1735.

The Husbandry of L. Junius Columella, in twelve books, with his book concerning Trees; translated from the Latin by Gibson, 4to—1744.

A Treatise of Fruit Trees; by Thomas Hill, gardener to Lord R. Manners, &c. Third edition, 1760.

Miscellaneous Tracts relating to Natural History, Husbandry and Physick, to which is added the Calendar of Flora; By Benjamin Stillingfleet. London, third edition, 1775—391 pages, 11 plates of Grasses.

Practical Treatise on cultivating Lucern; by Bartholomew Rocque, 8vo. 1765.

Elliot's Essays on Field Husbandry in New-England, 1764.

Foreign Essays on Agriculture and Arts, containing the Discoveries made in the Several Provinces of France, Germany, Flanders, Sweden, and Switzerland, 8vo—1764.

A Treatise on Hemp; translated from the French of M. Marcandier, 12mo—1764.

The Complete Grazier, or Gentleman and Farmer's Directory, 8vo—1767.

A Tour in Ireland, with General Observations on the Present State of that Kingdom, made in the years 1776, 7 and 8, and brought down to the end of 1779; by Arthur Young. Second edition, 2 vols.—printed 1780.

A Treatise on the Management of Bees; by Thomas Wildman. Second edition, with an appendix, 8vo.—1770.

The American Traveller, or Observations on the present state, culture, and commerce of the British Colonies, 4to.—1770.

Georgical Essays; by A. Hunter, M. D. F. R. S. Six vols 8vo.—1803 and 1804.

American Husbandry; containing an Account of the Soil, Climate, Productions, and Agriculture of the British colonies in North America and the West-Indies, by an American. In two vols. 8vo. London, Bew, 1775.

Observations on the Grafting of Trees; by Thomas Andrew Knight, Esq. in philosophical transactions for 1795.

Report of the Committee of the Board of Agriculture, concerning the Culture and Use of Potatoes. London, Nicol. 1795, 4to.

A Treatise on the Culture of the Apple and Pear, and on the Manufacture of Cider and Perry; by T. A. Knight, Esquire, 1797—12mo.

Agricultural Reports for Northumberland; by J. Bailey and G. Culley; of Cumberland, by the same; of Westmoreland, by A. Pringle; and Suffolk by A. Young, 8vo.—1797.

Communications to the Board of Agriculture, on Subjects relative to the Husbandry and Internal Improvement of the Country, 1 vol. 4to 1797.

Translation of the Linnæan Society, vol. 4th; Description of the Blight of Wheat, Uredo Frumenti, by A. B. Lambert, Esq. Further Observations on the Wheat Insect, by M. Marsham. History of Tipula Tritici and Ichneumon Tipulæ, with some Observations upon other Insects that attend the Wheat, in a letter to Thomas Marsham, Esq. By the Rev. William Kirby, 1798.

Agricultural Reports (in 8vo.) for Middlesex, by John Middleton, Esq.; Nottinghamshire, by Robert Lowe, Esq.; Somersetshire, by Robert Billingsley, Esq.; Argyllshire, by John Smith, D. D.; Clydesdale, by John Naismith; Roxburgh and Selkirk, by Robert Douglas, D. D.—1798.

Fifth volume of the Linnæn Transactions, 1800.

A Short Account of the Disease in Corn, called the Blight, the Mildew, and the Rust; by Sir Joseph Banks. London, 4to—14 pages and two plates, 1805.

A Complete System of Practical Agriculture; by R. W. Dickson, M. D. of Hendon, Middlesex. Two vols. 4to with plates, 1805.

Young's Works, 8vo. 13 vols.
Stone's Review, 8vo. 1 vol.
Marshall's Southern Counties, 8vo. 2 vols.
Marshall's Minutes, 8vo. 2 vols.
Anderson's Essays, 8vo. 3 vols.
Anderson's Recreations, 8vo. 4 vols.
Bath Society's papers, 8vo. 9 vols.
Agricultural papers. Published by the Board of Agriculture in England, 4to, 5 vols.
Elkinton on draining wet lands, 4to. 1 vol.
Mr. Mahon's Gardening, 8vo. 1 vol.
Farmer's Dictionary, 8vo. 1 vol.
Farmer's Callendar, 8vo. 1 vol.
Forsyth on Fruit Trees, 8vo. 1 vol.
Agricultural Tracts, 8vo. 1 vol.
Banister's Husbandry, 8vo. 1 vol.
Flora Rustica, 8vo. 1 vol.
Memoirs of the Philadelphia Agricultural Society, 8vo. 2 vols.
Michaux's Arbres Forestiers, 8vo. 1 vol.
Hawes on Agriculture, 12mo. 1 vol.
Complete Farmer, folio, 2 vols.
Farmer's Magazine, 8vo. 6 vols.
Recreations in Agriculture, Natural History, &c. 8vo. 1 vol.
New York Society's Publications, 4to. 4 parts.
Michaux's Flora Boreali Americana, 8vo. 2 vols.
Lasteyria on Merino Sheep, 8vo. 3 vols.
Daubenton's advice to Shepherds, 8vo. 1 vol.

PREMIUMS

Offered by the Trustees of the Massachusetts Society for Promoting Agriculture.

1. To the person who shall have raised within two years from the first day of June, 1814, the greatest quantity of woad within this Commonwealth, not less however than three hundred pounds, and shall produce to this Board specimens of the same, provided the quality thereof be good, a premium of *one hundred dollars.*

2. To the person who shall within three years from the first day of June, 1814, produce a specimen of madder of good quality of his own growth, and who shall have actually raised the greatest quantity thereof, in this Commonwealth, being not less than 1000 pounds, a premium of *one hundred dollars.*

3. To the person who shall invent the most approved machine for thrashing or separating grain, (regard being had to its fitness for a medium farm,) a premium of *one hundred dollars* ; to be claimed on or before the first day of June, 1816.

It is requested that the communications, for which the foregoing premiums are offered, be accompanied with proper certificates from the selectmen, magistrates, or clergymen of the vicinity, or other vouchers, to the satisfaction of the Trustees ; that they be delivered without names, or any intimation to whom they belong ; and that they be severally marked in such manner as each claimant shall think fit ; the claimant sending also a paper, sealed up, having on the outside a corresponding mark, and on the inside his name and address.

RICHARD SULLIVAN, *Recording Secretary.*

Capt. David Low – to be left at Byfield's
– from his friend and humble servant
Gorham Parsons

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